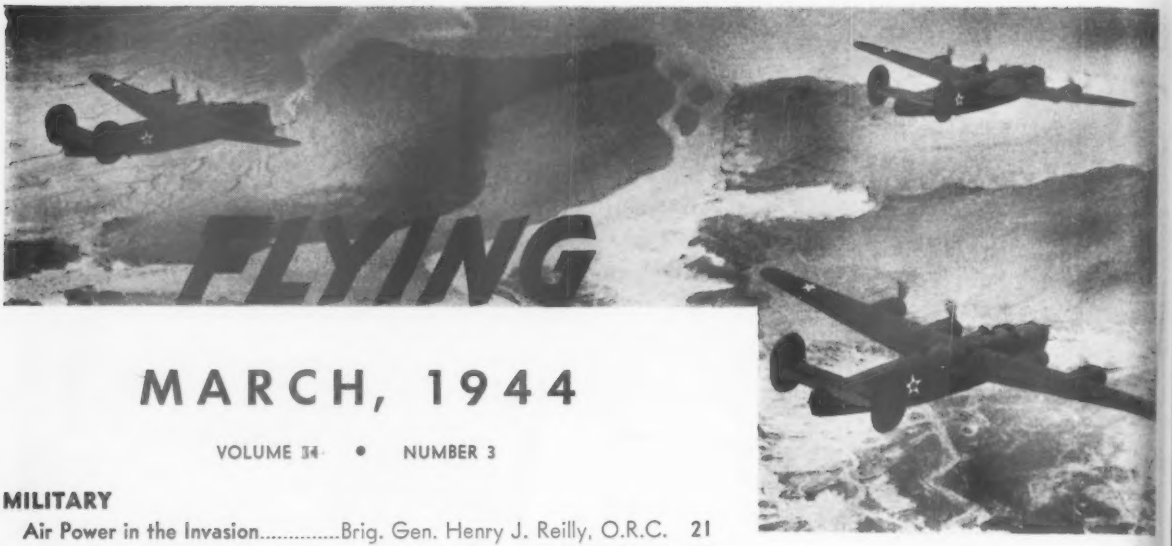


# MARCH, 1944

VOLUME 34 • NUMBER 3

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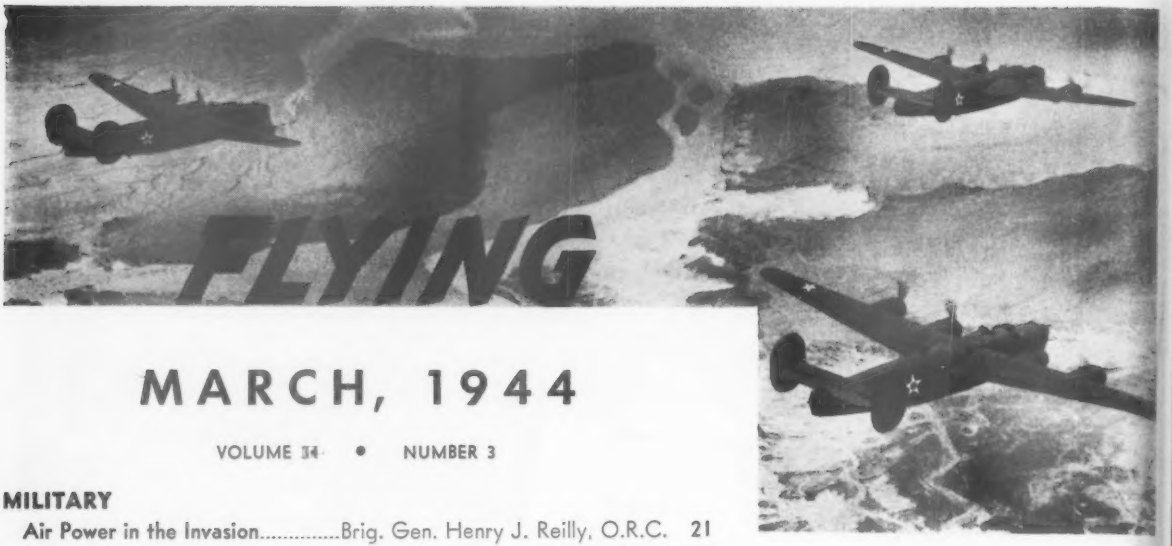


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# HOW AVIATION-MINDED ARE YOU?

## A Vital Message to "AIR-CONDITIONED" People!

It must be apparent, even to the least discerning among us, that the world is on the threshold of a rapidly-developing air age, with virtually no limits to advancement in aviation of the future. But the question is, has the significance of this situation been brought home to YOU.

Perhaps your own personal enthusiasm for aviation leads you to believe you are sufficiently air minded. What about checking on yourself, to make sure? Until you do something more than merely become excited over aviation possibilities, you definitely are not "air-conditioned." You've got to prepare yourself. You've got to be ready to Act when opportunity presents itself.

In common with other intelligent people you can visualize what's going to happen in aviation. Well, what do YOU propose to do about it? Are you going to stand idly by and content yourself with feeling strongly about it? Or do you propose to equip yourself to play an important part in the inevitable development? Are you determined to get the best possible technical training—AND TO DO IT NOW?

CURTISS-WRIGHT TECHNICAL INSTITUTE, recognized as one of the country's outstanding Aeronautical Schools, offers you the best to be had in the way of specialized training in Aeronautical Engineering and Master Aviation Mechanics.

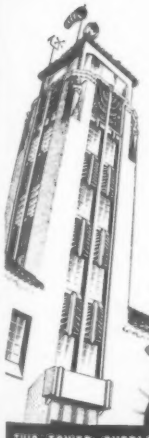
Since the founding of this institute in 1929, its unwavering objective has been to prepare young men to advance in aviation; to qualify them to assume increased responsibilities; and to enhance their earning power. Today this particular training is more than ever valuable. Aviation needs and will continue to need trained, highly skilled men.

The practical value of this up-to-the-minute training has been demonstrated and proved time after time by the success of thousands of Curtiss-Wright Tech graduates and by the constantly increasing demands for this service. What the institution has done for others it can do for you.

If you are indecisive about where to go for the training you require, consider this. Mr. Donald Douglas, president of Douglas Aircraft Company, wanted his son to have precisely the schooling and training you contemplate. Naturally, the boy could have been sent anywhere the father decided upon. Outstanding merit of the school was the only consideration. And where did Mr. Douglas send his boy? The answer is easy—CURTISS-WRIGHT TECHNICAL INSTITUTE.

Time and tide, it is said, wait for no man. Don't delay. Act now. Get your essential training at CURTISS-WRIGHT TECH. . . . Send coupon TODAY . . . It will bring illustrated catalogue . . . Free . . . No obligation.

Get "AIR-CONDITIONED."

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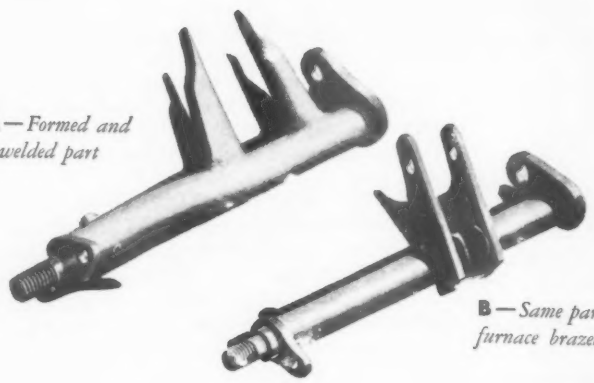
# Trail Blazing in the Skies

## PIONEERING NEW METHODS



A—*Formed and welded part*

B—*Same part, furnace brazed*

**HOW GOODYEAR AIRCRAFT CORPORATION SERVES THE AIRCRAFT INDUSTRY**

1. *By constructing subassemblies to manufacturers' specifications.*
2. *By designing parts for all types of airplanes.*
3. *By re-engineering parts for mass production.*
4. *By extending our research facilities to aid the solution of any design or engineering problem.*
5. *By building complete airplanes and airships.*

**ELECTRIC FURNACE BRAZING OF PARTS INTO ASSEMBLIES**—a highly successful Goodyear Aircraft adaptation of furnace brazing permits assembly from simple machine parts of many items that formerly had to be "hogged out" or welded—saving time and labor, and producing a strong part at low cost.

## BUILDING PROVEN AIRCRAFT

**THE DEADLY FG-1 CORSAIR FIGHTER** is being built by Goodyear Aircraft, now one of its principal producers. The quality of Goodyear craftsmanship and methods, as demonstrated in production-line output of this "hot" airplane, has won high commendation from the U. S. Navy.

Let's all back the attack with **WAR BONDS**

GOODYEAR AIRCRAFT

©1944, The Studebaker Corporation

## Studebaker craftsmen build engines for this latest model Flying Fortress

HERE'S the mightiest Boeing Flying Fortress of them all—the brand-new B-17G.

At first glance, it doesn't look much different from previous Fortress models—until you notice that new turret under the bombardier's platform with its two devastating 50-caliber machine guns.

Studebaker builds Wright Cyclone engines for this invincible Boeing bomber. And the assignment is a logical recognition of a great engine-building reputation, so brilliantly exemplified for many years in the fine power plants of the famous Studebaker Champion, Commander and President cars.

Studebaker engineers, production experts and craftsmen fully recognize the urgent needs of our armed forces for more and more equipment.

That's why they're sparing no effort on the Wright Cyclone engines for the Flying Fortress, the big multiple-drive military trucks and the other vital matériel they've been delegated to produce.

**Studebaker builds tens of thousands of big, multiple-drive military trucks—** They're serving the United Nations all over the world. Studebaker is now one of the largest manufacturers of heavy duty war trucks.

★ BUY U. S. WAR BONDS ★

*Awarded to Aviation Division* ARMY-NAVY E *of The Studebaker Corporation*

# Studebaker BUILDS WRIGHT CYCLONE ENGINES FOR THE BOEING FLYING FORTRESS

# They Look Alike But One Tire Has 64% More Strength

These three U. S. Royal Airplane Tires look alike. And yet what a difference there is—an all important difference that means thousands of pounds of extra fighting power.

The Army and the Navy needed tires that could carry the greater loads of today's long range air warfare, tires of vastly greater strength and reduced weight. Overall size could not be increased. Drawing on their experience in pioneering the rayon cord tire, "U. S." Airplane Tire Engineers developed a new tire built with nylon cords. Weight was reduced 16% from cotton cords and strength increased 64%. Today, these giant Nylons are serving on Army and Navy planes under the toughest landing and take-off conditions, pointing the way to the stronger, lighter, better airplane tires for the future.

*Listen to the New York Philharmonic Symphony broadcast over Columbia network every Sunday afternoon 3:00 to 4:30 P. M. Eastern War Time.*

UNITED STATES RUBBER COMPANY

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# The Birdmen's Perch

WE'RE FLYING the Gulfhawk out of Ft. Worth these days. Being this close to the world's largest butadiene plant gave us a yen to see it. So we gassed up with G.A.G., strapped Flutter on the wing, and headed for Port Neches.

Perch Pilots—*it would take forty five million rubber trees to produce the*

*rubber that will be made in one year from that butadiene!*

We told you last month that the Neches Butane Products Company (that's the name of this nonprofit organization) covers 314 acres. Now we want to amend that statement.

It not only covers it . . . it *blankets*

it and soars over it! Why, there are towers there that are 15 stories high. Fourteen of them! And there is other equipment that is so complex and so big that it looks downright immoral.

When Gulf and four other petroleum companies all pitched in with the Government to design, build, and operate this gigantic butadiene plant, they proved again that the oil industry has only one thought—a victorious peace.

*Major Al Williams,*

alias "Tattered Wing Tips "Gulf Aviation Products Manager, Gulf Bldg., Pittsburgh 30, Pa.

## BRAINTWISTER

Erwin Schwatt is one of our favorite Perch Pilots—and we're sending him a Perch Diploma to prove it.

For years now, we've worked on the Perch knowing that if we ran short of Braintwisters or Whoppers, all we had to do was to reach into the mailbox . . . and find exactly what we needed from Erwin Schwatt.

Well, we ran short of Braintwisters this month, reached into the mailbox, and sure enough . . .

"A pilot crosses the equator, flying southeast, (135°). In 72 hours (nonstop

on G.A.G.) he is just 5 miles from the South Pole. What will his approximate position be 3 hours later (still flying)?"

Schwatt—may his engine never cut—sent the answer, and we'll shoot it along to you if you write.

## TAKE IT OFF!

Many warplanes in this country are being stripped of their warpaint.

Removing the greenish-gray camouflage paint from a bomber makes more difference in the plane's performance than

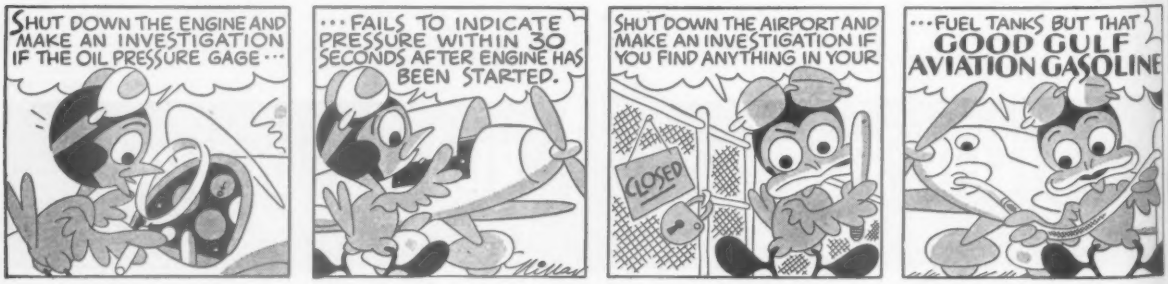
you might think. For with the paint removed, the 17's and 24's can actually go farther and carry a greater load!

In lubricating oils, there are certain parts which are just as superfluous to the job of lubrication as camouflage was to planes in domestic service. In Gulfpride, however, these unnecessary components have been removed to the *nth* degree by an extra refining step, the Alchlor Process. And with more of these troublemakers removed, Gulfpride can actually go further in your engine and carry a greater lubrication load than inferior lubricants.

Gulf Oil Corporation and Gulf Refining Company...makers of

GULF GULF AVIATION PRODUCTS

OIL IS AMMUNITION—USE IT WISELY


SHUT DOWN THE ENGINE AND MAKE AN INVESTIGATION IF THE OIL PRESSURE GAGE···
···FAILS TO INDICATE PRESSURE WITHIN 30 SECONDS AFTER ENGINE HAS BEEN STARTED.
SHUT DOWN THE AIRPORT AND MAKE AN INVESTIGATION IF YOU FIND ANYTHING IN YOUR
CLOSED
···FUEL TANKS BUT THAT GOOD GULF AVIATION GASOLINE

*Finish the Fight with War Bonds*

# Flight without Wings

There is no roar of engines when the great, gleaming fuselage of a Boeing Flying Fortress makes its first flight. Smoothly and quietly it glides above the compact rows of partly completed bodies to the final assembly line. After the overhead crane has set it down in position, the wings, tail surfaces and landing gear will be joined to the fuselage and the big bomber will be ready for the air.

Thrilling even to the uninitiated, this scene holds a far deeper significance for the trained technical man. It typifies an entirely *new development* in production engineering—a major Boeing contribution to wartime speed and efficiency.

The Boeing system emphasizes short-flow, multiple-line production. It provides maximum use of every foot of plant space. It allows for flexibility in design —vital to rapidly changing combat needs. *And it turns out planes faster.* Boeing's rate of production today is 10 times what it was the month before Pearl Harbor.

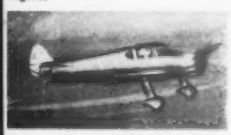
Boeing production engineers have proved that by completing each section of a plane separately, and bringing the sections together only in the last stages of assembly, both space and time are saved. After a plane receives its wings it occupies several times as much room as when it is in sections. That is why even the wiring of a Fortress is fully assembled and installed before the final joining of wings and fuselage.

*Without such basic innovations in design, engineering and manufacture, Boeing could never have achieved the swiftly multiplied production that now darkens enemy skies. True today, it will be true of any product tomorrow . . . if it's "Built by Boeing" it's bound to be good.*

DESIGNERS OF THE FLYING FORTRESS • THE NEW B-29 SUPER BOMBER • THE STRATOLINER • TRANSOCEAN CLIPPERS **BOEING**

RYAN-STANDARD cabin plane; pioneer passenger airliner.

RYAN BROUGHAM, widely used commercially and for many famous flights.



RYAN S-C, cabin plane for private-owner use, featured all-metal construction.

RYAN YO-51 "Dragonfly", Army observation plane with unique performance ability.

RYAN NR-1, low-wing trainer used for formation flight instruction by Navy.

RYAN ST3-S, seaplane trainer of same series as Army's PT-22.

RYAN PT-25, superbly engineered plastic-bonded plywood trainer.

# Why the Score was 93 to 6

The report on that recent amazing air battle, when 93 Japanese planes in the South Pacific were destroyed in the air with a loss of only 6 American aircraft, has been confirmed and made official.

The analysis of military experts gave much credit to the superior fire power and armament of the American planes. But they all came to one conclusion: That the American pilots were better because they were *better trained*. To *this* they gave most of the credit.

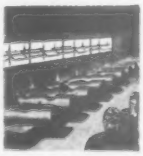
Close to the heart of every member of the Ryan manufacturing and training organizations are the thousands of combat pilots—trained in Ryan *planes* and by the Ryan *schools*—who are now fighting on every front. Seventeen years' experience training commercial pilots and four years training military flyers has enabled the Ryan School of Aeronautics to play an important part in giving America the better trained pilots, whose superiority is attested by outstanding combat records and hundreds of decorations for aerial skill.

For years Ryan training has been based on *thoroughness* and *exactness*. Now entirely devoted to training military pilots, Ryan Schools in peacetime will continue to be dedicated to the same high standards.

*RYAN SCHOOL OF AERONAUTICS, operating bases; Hemet, Calif., Tucson, Ariz.*

# RYAN

*Rely on Ryan to Build Well*



**RYAN BUILDS WELL**

Ryan construction, proven in aviation's pioneer days, now proven in war, will tomorrow produce safer, more useful peacetime aircraft.

**RYAN TRAINS WELL**

Ryan School of Aeronautics, famous peacetime air school, now training fine U.S. Army pilots, follows one creed: **Thoroughness.**

**RYAN PLANS WELL**

Modern engineering + **flying experience.** Typical result: Ryan exhaust manifold systems are now used on the finest planes of other manufacturers.

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# WHAT MAKES AN ACE?

An ace is judged by the number of enemy planes he downs. ★ By that standard the Allison engine rates high. ★ In four years of service on every active front, more enemy aircraft have been knocked out by Allison-powered fighters than by any other American plane. ★ Precision pays in perfection of performance.

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LIQUID-COOLED AIRCRAFT ENGINES

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*P-38 — Lightning • P-39 — Airacobra • P-40 — Warhawk • A-36 and P-51 — Mustang*

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Illustrated at right is a typical crystal manufactured by Aircraft Accessories Corporation and used in both ground and plane radio installations by America's commercial airlines. Many other types of AAC crystal units are being supplied various branches of the armed service and other government agencies.

Today, practically all AAC facilities are devoted to war production. Tomorrow, advanced AAC electronic developments will be available for the post-war world.

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REALIZING the extreme importance placed by the airlines upon the proper maintenance of their communications facilities, Aircraft Accessories Corporation has set aside a special division of its crystal laboratories to provide rapid delivery to airlines and associated communications services of a variety of standard crystals. *Deliveries in limited quantities can be made within a few days* after receipt of purchase order with adequate priority.

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The services of our Engineering Department in designing special equipment are available to you without obligation.

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**ON THE MARTIN B-26**

**ON THE BOEING B-17G**

PLEXIGLAS, developed in Rohm & Haas laboratories, made possible the familiar plastic "greenhouse" that is the modern bomber's nose—and eyes!

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Transparent PLEXIGLAS enables the nose gunner — and gunners in the turret, belly, waist and tail—to aim and fire with deadly accuracy. This transparency is permanent, undimmed by time or extended weathering.

### SAVES PRECIOUS POUNDS

The strength of PLEXIGLAS is also permanent, providing constant protection from wind, weather, and freezing slipstreams. Yet PLEXIGLAS is only half as heavy as ordinary glass, permitting our bombers to carry bigger bomb loads and larger fuel supplies.

## ROHM & HAAS

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# In nose sections on American heavy and medium bombers, PLEXIGLAS gives crystal-clear, unobstructed vision...protects the gunner from wind and freezing weather...saves precious flying pounds!

## FOR YOUR POST-WAR PLANE

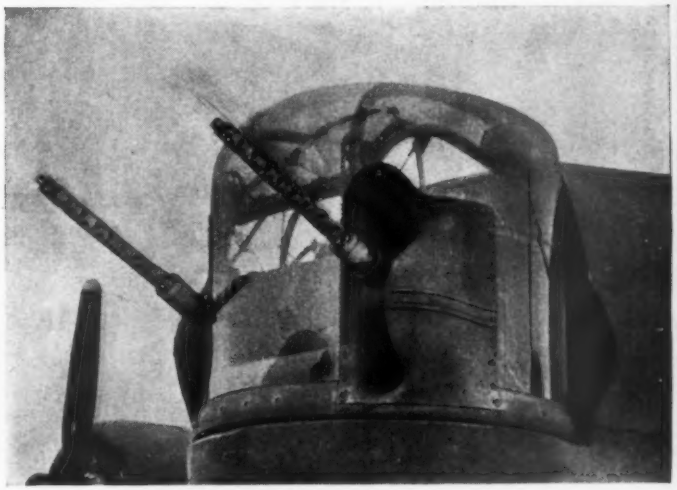
PLEXIGLAS has now been seeing active service for 8 years. Over this period, it has continually demonstrated its durability on all types of aircraft under wide extremes of weather conditions.

When the war is won, and you're picking your private post-war plane, be sure it's equipped with PLEXIGLAS enclosures. You can count on the superior optical properties . . . strength . . . and permanence of PLEXIGLAS.

*Only Rohm & Haas makes* PLEXIGLAS

*3 awards to Rohm & Haas Company and its associated firms, The Resinous Products & Chemical Company and Charles Lennig & Company.*

PLEXIGLAS *is the trade-mark, Reg. U. S. Pat. Off., for the acrylic resin thermoplastic sheets, rods and molding powders manufactured by Rohm & Haas Company.*



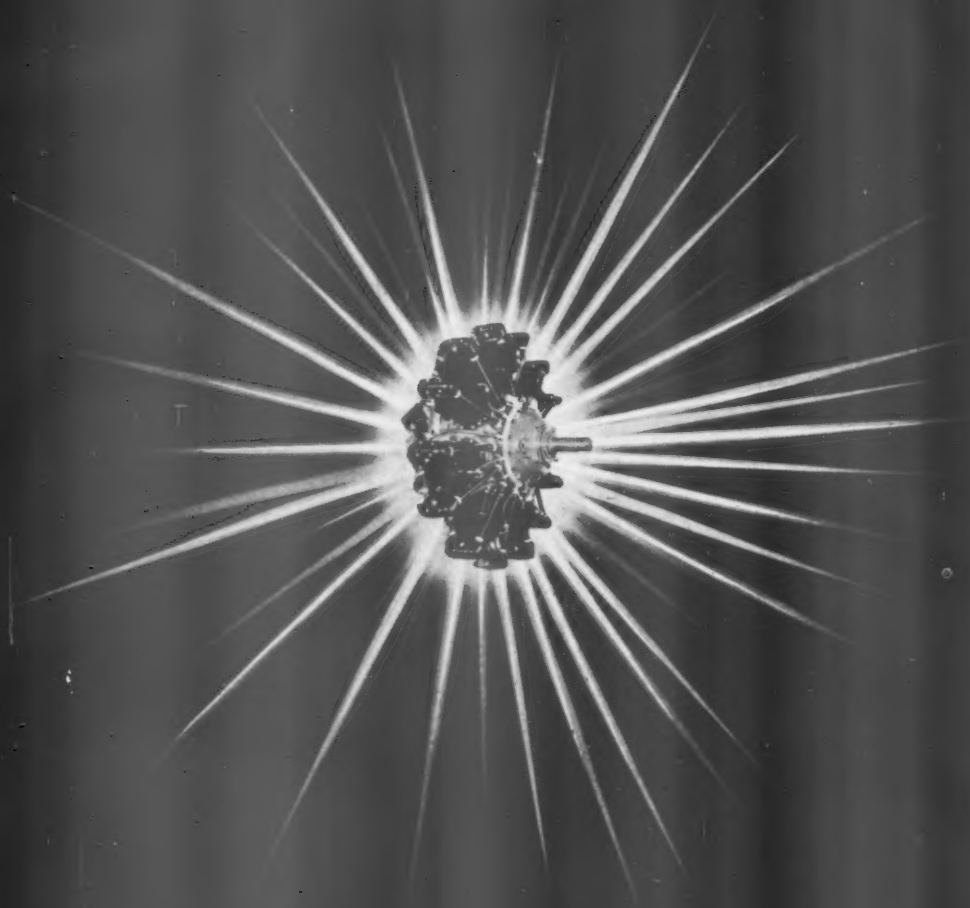
**ON THE CONSOLIDATED B-24**

**ON THE NORTH AMERICAN B-25**

COMPANY

*WASHINGTON SQUARE*
*PHILADELPHIA, PA.*

Fungicides . . . Enzymes . . . Chemicals for the Leather, Textile and other Industries



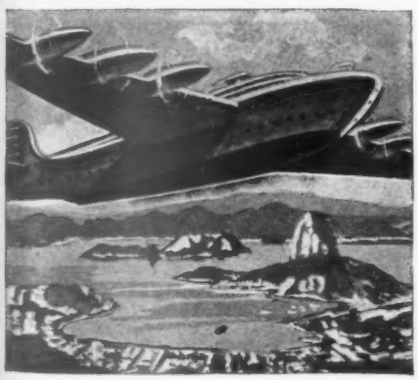
*Fine as a Jewel*

JACOBS
AIRCRAFT
*Engines*

POTTSTOWN, PENNSYLVANIA, U. S. A.

*Firepower:* Lethal tail turret of Marauder contains two of the many heavy guns mounted on this aerial arsenal. Newer Marauders have over twice the firepower of the ones which rang up the 90-to-6 score over New Guinea. Gun turrets designed and manufactured by Martin . . . America's first . . . are standard not only on Martin ships but on many other American planes.

*Bombpower:* Within their perfectly streamlined fuselages Marauders carry an annihilating load of bombs . . . more, in fact, than carried by some heavy bombers. They may unleash several blockbusters, scores of fragmentation bombs, or hundreds of incendiaries, depending upon their mission. Such bombpower enables them to blanket target areas, to overwhelm enemy ground defenses.



*Airpower* already is remaking tomorrow's world. Martin has designed giant airliners of 125 tons, is planning others of 250 tons. Carrying scores of passengers, providing every comfort, these great luxury liners will make London an overnight hop from New York: Rio, a single day's flight: Australia, a weekend jaunt. Tomorrow—for comfort, speed and safety, fly Martin!

# How Martin Marauders rolled up a 90 to 6 score in New Guinea

DURING the dark days of 1942 a group of Martin Marauders was rushed to hard-pressed Australia. These deadly bombers blasted Jap installations, wrecked Jap airfields, sank Jap ships, strafed Jap ground troops. When the Jap juggernaut finally shuddered to a stop, it was found that the Marauders had downed 90 Zeros in aerial combat against a loss of only 6 Martins.

**SECRET OF THE MARAUDERS' SUCCESS**

How were the Marauders able to score such an overwhelming victory? The answer is *power* . . . terrific bombpower to completely demolish their objectives in one swift devastating attack . . . and withering firepower from every angle to rip apart enemy interceptors seeking to bar their way. Such heavy bombload and weight of armament, carried at rocket-like speed, make the Martin Marauder no ship for grandma to fly . . . but in the hands of America's best pilots it's the hottest, hardest-hitting thing on wings!

**HITCH YOUR WAGON TO A STAR**

If you've got what it takes to fly ships like the Martin Marauder, now's the time to hitch your wagon to a star . . . the white star of the Army Air Force. When you ask for the Air Force, you'll get action! What's more, you'll get complete training in the trade of tomorrow . . . aviation. For action today, opportunity tomorrow, sign up with the Army Air Force!

THE GLENN L. MARTIN CO., BALTIMORE-3, MD.
THE GLENN L. MARTIN-NEBRASKA COMPANY—OMAHA

Martin AIRCRAFT

BUILDERS OF DEPENDABLE AIRCRAFT SINCE 1909

# Beechcrafts at work

In the three specialized types of Beechcrafts shown in formation below, a large proportion of Air Forces bomber crews gain the skills that serve them so well in their flights over Axis targets. ★ Pilots learn the technique of handling heavy, fast, multi-engine bombers in the plywood AT-10 Beechcraft transitional trainer (leading formation). ★ Navigators master their complex art in the all-metal AT-7 (Navy SNB-2) Beechcraft navigation trainer (second in formation). ★ Bombardiers learn to make the most of those crucial split seconds over the target in the all-metal AT-11 (Navy SNB-1) Beechcraft bombing trainer (third in formation) which is also adaptable for instruction in flexible aerial gunnery. ★ Like the commercial Beechcrafts which were prototypes of the AT-7 and AT-11, these trainers combine near-tactical high cruising speeds with exceptionally low landing speeds, easy maneuverability, and great sturdiness. ★ Like the men they help to instruct, these Beechcrafts work hard and efficiently at their vital tasks with the world's finest Air Services.

Beech Aircraft CORPORATION

BEECHCRAFTS ARE DOING THEIR PART

WICHITA, KANSAS, U. S. A.

# AIR POWER IN THE INVASION

Fortress vapor trails over Germany—grim portent of the stern days ahead.

By Brig. Gen.
HENRY J. REILLY, O. R. C.*

*Aviation has made the invasion possible and its proper use can be the decisive factor, asserts General Reilly.*

THE establishment of a second front by the invasion of Western Europe has been decided upon.

The use of aviation will be the decisive factor. It lies within the power of our aviation to determine whether the invasion will be a success with moderate losses, a success with very heavy losses, or even, perhaps, a failure.

The invasion will entail enormous difficulties. It will involve the most difficult fighting under adverse conditions against very strong defenses. It must not fail or bog down in trench lines after bloody losses.

But unless we change our present concepts of air tactics and aviation support of ground troops the danger exists that we shall not only suffer enormous casualties but perhaps a serious defeat.

Picture what our troops will have to face wherever they invade Europe:

The landing barges will have to land on the beach under heavy fire. The troops that land will have to go inland through beach defenses of all kinds. They will have to overcome barbed wire, tank traps, mines. They will be under constant fire from machine guns, field guns in concrete emplacements, mortars of all sizes—all themselves well protected from our fire.

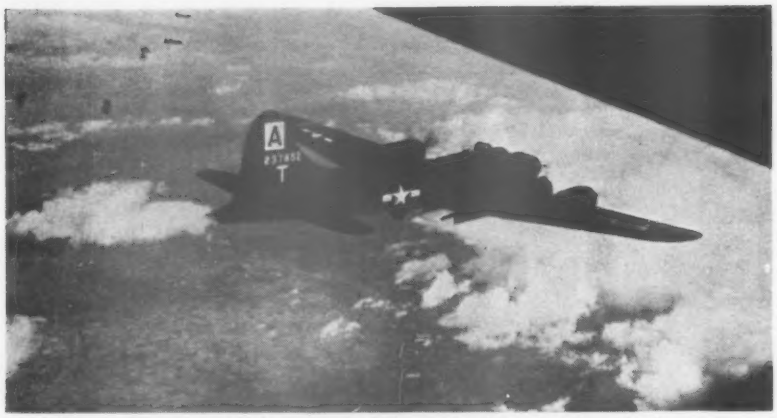
They will have to go through a heavily defended belt 20 to 50 miles deep—there is no question of a mile or two of defenses as at Tarawa, or of no permanent defenses as in Africa and Sicily.

Every gun emplacement and defended point of every kind that they take will be subject to flanking fire from other guns. Every open space will be criss-crossed with fire. They will be subject to bombing of all kinds and to aerial strafing.

They will be under constant counter attacks from the front and from the flanks made by the German infantry supported by field guns, and they will have to fight off the constant direct aerial support which the German aviation *always* gives to the German troops fighting on the ground.

The success of our Marines at Tarawa

**The views expressed here are those of General Reilly and not necessarily those of Flying.*



When the invasion comes, the author would forego bombing operations like these over Munster to concentrate all available aircraft in direct support of invading troops.

will not be too close a parallel. Tarawa was an island, not very long to right and left and not very far from the front beach to the rear beach. Our invading troops on the continent will have to face a position many times as wide from right to left and many times as deep from front to rear as at Tarawa.

The proper use of aviation is the decisive weapon to turn the tables against such opposition. Why is this so?

Dieppe and Tarawa, in general, both show that we are confronted with the same problem of breaking through a strong line of fortifications which caused such heavy losses to the Allies in the last war. This writer saw the "race to the sea" in the fall of 1914. When it was over, the Allied left flank and the German right flank were resting on the British Channel. This established a stalemate from that channel along a fortified line to Switzerland. *From then on, until assaults made at the end of September, 1918, all efforts of both the Allies and the Germans to break completely through this line failed.*

And why did they fail?

First, because the 1914-1918 situation compelled frontal attacks because flank attacks were impracticable. The right flank resting on the sea could not be turned without an invasion of Belgium from the sea. The Swiss flank could only be turned by the violation of Swiss neutrality which the Swiss would have resisted and which the Germans would have helped them to resist.

Second, an invasion from the sea was a virtual impossibility under the war conditions of that time. The attack on the Dardanelles and various shellings and raids on the Belgian Coast had proved that coast fortifications at that time could keep navy vessels well off shore.

Third, with the rigid fortified line and no flanks to be turned, a strategical surprise was impossible because, once emplaced, the artillery and ammunition needed for an attack could not be moved quickly to another part of the line. It took many days and usually several weeks to emplace all the guns and ammunition necessary for a big attack. In olden days, armies were small enough and compact enough to be maneuvered rapidly and handled in such a way as to outflank the enemy or hit him suddenly at an unexpected spot. With the huge mass armies of modern times, however, such surprises became impossible. It was impossible to conceal the months of preparations necessary for a major battle.

Fourth, the heavy artillery attacks of the war of 1914-18—notably in the battle of Verdun—finally failed because of (1) the tremendous expenditure of ammunition and (2) the necessity to keep the artillery moving forward. The tremendous effort necessary was possible for the lighter guns only. At Verdun, the Germans over a period of months slowly crushed the French resistance—principally by the brutality of their artillery fire. They finally failed because of the impossibility of maintaining such fire. The law of diminishing returns operated until the German attacks, so successful in the beginning, finally petered out. The same was true of the British attack with a certain amount of French help on the Somme. As at Verdun, the law of diminishing returns brought the attack to a halt without a decisive break-through.

These four conditions which limited operations during World War I have all been changed by aviation.

First, the strategical possibilities of aviation today enable a far-reaching strategy by which the German right flank could be turned by the seizure of Norway and perhaps Denmark. (Early in 1940, the chairman of the aviation committee of the French Senate invited Paul Reynaud, then Minister of Finance, to dinner at his house to listen to the author's arguments in favor of this strategy.) The German left flank could be turned by the seizure of the French southern coast.

Second, aviation today can give warships the support necessary to enable them to engage shore batteries with success for the first time in many decades. Nelson's entry of Copenhagen Harbor under fire and Farragut's entrance into Mobile Harbor under fire, where he said "Damn the torpedoes, full speed ahead," had become merely history which no 1914-18 admiral could hope to duplicate. The landings in Sicily and Italy in this war were made where there were no serious coast defenses. It is doubtful if our warships could have come close enough to Tarawa to support the landing of the Marines had it not been for our Naval aviation.

Third, aviation is so flexible that it introduces once again the elements of surprise and maneuver into modern warfare. It is perfectly possible, for example, to make the air concentrations necessary to indicate a coming attack, say in Norway and Denmark, and shortly thereafter give the same indications of a coming attack on the southern coast of France and then switch to a real attack across the British Channel and North Sea or the Bay of Biscay coastline of France from Brest to the Pyrenees. In other words, if the fullest advantage is taken of the strategical and tactical possibilities of aviation today, we are in a position to overcome the disadvantages which led to failure after failure on the part of both sides to break completely through the enemy's position and obtain decisive victory in the last war.

Fourth, by its power to fly directly over a target, aviation has greatly increased the firepower possible in an attack. Its flexibility is enormously greater than that of artillery because of its ability to start from widely scattered aviation fields or bases. Its long range gives it a power to put concentrated fire on targets on a scale impossible for artillery limited by short range. Had the power of modern aviation been in existence at the time of each of these battles, its tremendous firepower concentrated to back up the German artillery and infantry at Verdun would undoubtedly have been sufficient to give the Germans a decisive victory. This would have ended the war in Germany's favor at Verdun. Similarly, the British and French would have won a decisive victory on the Somme.

How, then, must aviation be used properly to support the invasion?

First, it must use the elements of surprise, by hitting at unexpected places, by making feints, and by using the power of maneuver and surprise. Why have this power of surprise without using it?

Second, it must be used tactically as preparatory fire to break down the enemy's defense works so far as possible before any attack starts at all. This does not hamper the element of surprise because aviation firepower can be switched from target to target. The enemy need not know where the attack will come. Our aviation ought to go after all the fortified coasts for months. Most people who have not seen war at first hand have no concept of what modern fortifications will stand.

Third, after the tremendous battering of the invasion coasts, aviation must assist in covering the landing troops and the advancing troops with fire on every single one of the defensive works ahead of the infantry and tanks.

Fourth, and most important, is that wherever the invading troops are trying to go forward there must be an accompanying fire, *not more than 200 yards ahead of them* to keep the enemy in their defenses and fox holes. Under no circumstances must the enemy be per-

## EUROPE'S INVASION COASTS AND ALLIED AIR BASES

mitted to separate the attacking troops and the barrage, or the barrage be permitted to get too far ahead so that the defenders have time to come up after it has passed and turn a murderous fire on the attacking troops. This bombing barrage must be conducted by airplanes closely co-ordinating their attacks with the ground troops below. It is not merely a question of the tonnage of bombs dropped by the attacking planes but of directing that tonnage to specific defending targets.

The use of air to support our invading troops in the exact manner prescribed in the above paragraph is vital to the success of the operation. Here are some of the contributing reasons:

Naval guns will be the only artillery other than airplanes available for the initial landing. Tarawa showed the difficulty of getting adequate support from naval guns. These guns are designed to have a flat trajectory—the shell goes straight to the target. While this is essential to fight other ships or airplanes, it too often results in the shell only hitting the top of land fortifications and ricocheting off to explode more or less harmlessly in the rear. Land artillery, on the other hand, except anti-tank and antiaircraft, is designed so that the tra-

(*Continued on page* 146)

# CHINA

## By HOWARD WALDORF

*Almost a legend now, the plane that broke trail across the Pacific still flies the oceans after nine years and nearly 3,000,000 miles of travel.*

CHINA CLIPPER—God bless her—first showed her personality in December, 1934, when, while taxiing through boring but necessary preliminary water tests, she suddenly bounced herself into the air in an unauthorized flight. It was her first day out of the factory and here she was aloft, weeks ahead of the carefully worked out engineering schedule. She shook off the spray of Baltimore's Middle River and roared skyward.

The $390,000 plane was 30 feet in the air before her test pilot looked up from the instrument board.. Quickly she was forced back to the water. When the excitement died down and the escapade was traced to trim tabs which had worked into a climbing position, he patted her and called her a "grand old lady." No wonder, years later, when a mechanic was asked how many clipper planes were in port, he gave a passing glance at the larger Boeings, a lingering look at the veteran and answered: "Two and *China Clipper*, God bless her."

*China Clipper* went on with the water tests, but from the impatient way she flicked the wavelets with her propellers to the hurt look on her slightly upturned nose she made it plain that she wouldn't be happy until she was turned loose to fly to the far corners of the earth.

Today, as the silvered beauty of this best known of all transport planes is hidden under drab war paint and she shuttles back and forth over the Pacific ocean—or elsewhere—on secret military missions with almost 3,000,000 miles and reams of pioneering achievements behind her, the crews affectionately call her "Sweet Sixteen." This has a triple meaning for it compliments her glamor and youthful spirit and refers to the last two digits of her Federal license NC-14716. *China Clipper* had two Martin sisters. *China Clipper*, NC-14716, was delivered first; *Philippine Clipper*, (NC-14715) second, and *Hawaiian Clipper*, (NC-14714) third. (The reason for the reverse delivery was a modification program undertaken while the planes were under construction. *China Clipper*, being nearer to completion, had to be sent back for modifications which were made to her sister ships on the line.—Ed.)

Still going strong, this distinguished descendent of the clipper sailing ships of old has fulfilled all the dreams for which she was brought into this world and has seen more than her share of excitement. She opened the ocean trade routes of the world to air transportation and established a five-foot-shelf of records for carrying passengers and cargo. Her experiences range from speeding

China Clipper at her trial flight in 1934. Glenn L. Martin, with hand outstretched, in boat; standing in pilot's entrance is late Captain Musick.

# CLIPPER ☆ ☆ ☆ ☆

China Clipper has a wing span of 130 feet and weighs 23,100 pounds empty.

world leaders on history-changing missions and starring in a motion picture named after her (the first aviation film without a crash), to playing Cupid in shipboard romances.

More than nine years old now she paused in her war work only a year ago to receive her first complete dismantle-overhaul. Trouble-seeking engineers impolitely stripped her to fundamentals, thumped, scraped and X-rayed her, made a lone—and not actually required—replacement and pronounced her in perfect health. Back on duty, she flys an average of 10 hours a day, 500,000 miles a year—more than twice her peacetime working schedule. The engineers who once set her span of usefulness at five years now regard her as an institution that will go on for many more.

She started life as a challenge to the aircraft industry to produce an ocean liner of the air capable of scheduled service across the broad Pacific. The challengers were President Juan T. Trippe and Chief Engineer Andre Priester of Pan American Airways.

They said: "She must carry 52 persons and two tons of cargo at a cruising speed of 150 m.p.h. She must have a range of more than 3,200 miles to reach safely the steppingstones of the 8,210-mile run laid out for her. To top it all, she must pack more than her own dead weight. She must be equipped for operation by a multiple crew—captain, first pilot, navigator, engineer, radio operator and junior officers to stand watches as on shipboard, and she has to be absolutely seaworthy." This was in 1931, when 10-passenger transports that stayed in the air but a few hours at a time and cruised at less than 120 m.p.h. were looked upon as the last word.

Most of the industry shouted "impossible," but Glenn L. Martin, a manufacturing pioneer with ocean-spanning dreams of his own, answered the challenge. He and his engineers went into month-long huddles in which they shaped the dream plane to fill Pan American's colossal order. The performance requirements dictated four of the larg-

(*Continued on page* 132)

China Clipper today, in war paint with U. S. flag painted on her nose. She has flown many secret missions since war began.

# T For Turnover!

## By GAITHER LITTRELL

*With an average of 17,000 workers leaving their jobs each month, the aircraft production program is faced with a serious problem throughout the west coast area.*

BIGGEST bugaboo in the aircraft war production program on the West Coast today is turnover.

Turnover has become such a vast problem that the word is being spelled with a capital "T" and is even being used by telephone operators in certain airplane plants as a phonetic symbol, such as . . . "'T' as in turnover!"

And just what is Turnover?

It is an average of 17,000 workers leaving their jobs *each month* in the airplane plants on the Pacific Coast!

Out of 150,435 persons hired in the first six months of last year by the seven major airplane plants, the companies realized a net increase on their payrolls of only 20,291 persons.

Turnover is something so serious that the Aircraft War Production Council has figures showing the man-hours lost in 1943 by terminations are equivalent to the production of approximately 2,200 *Flying Fortresses!*

It is something so costly that Turnover loss last year was approximately $48,000,000—basing this calculation on the fact that it costs an average of $200 to hire and train each worker. But those dollars, divided by the cost of building a pursuit plane, would have paid for 640 of our prized single-seater fighters—*Mustangs, Thunderbolts, Lightnings* and *Airacobras.*

As the new year 1944 began, T. Claude Ryan, president of the Aircraft War Production Council, had this to say:

"We'll deliver the warplanes to smash the Axis.

"However, there is one major limiting

High rate of turnover (only 15 per cent of typical group at right will stay on job one year) has created demand for all able workers, regardless of age.

factor in our production—Turnover—and with the community's help we are gradually whipping even that.

"The biggest obstacle faced by the industry still is the fact that 17,000 workers leave their jobs in the aircraft plants every month. We are happy to report that the figure which had been averaging 20,000 workers a month, now is down to 17,000.

"If Turnover can be licked—and it *will* be licked as certainly as will Hitler and Tojo—then there should be no difficulty in not only meeting, but beating our 1944 production quotas.

"The way to conquer Turnover is for workers in essential war and community jobs to stay on those jobs and get this war won."

Solve the Turnover problem and the manpower shortage problem is whipped, it is believed by members of the Specialist Panel on Turnover and Absenteeism. This panel was set up by the companies represented by the AWPC—Boeing, Consolidated Vultee, Douglas, Lockheed, Northrop, North American and Ryan.

Turnover threatens to break down production schedules set for the new combat models due to make their appearance this year on the fighting fronts.

In a summary statement of the panel, it was said:

"In addition to engineering design and management, aircraft production requires plant facilities, materiel, equipment and manpower.

"Facilities have been provided. Our original plants were greatly expanded and vast new plants were constructed by the Defense Plant Corporation.

"We have, generally speaking, the necessary equipment. The materiel situation, until comparatively recently our most serious limiting factor and still an important cause of production delays, appears to be improving. If this improvement continues, we may expect generally good processing and distribution of materiel. A great deal of the materiel difficulty is—and has been—fundamentally a manpower problem.

"Manpower now looms as the limiting factor on Pacific Coast aircraft production. Shortages of manpower have for some time confronted companies at San Diego with serious obstacles to meeting their schedules and, for a still longer period, a Seattle company has fought the problem of personnel deficiencies.

"Now the problem has become general in the Los Angeles area, which for some time enjoyed greater resources of available manpower."

The summary states that the Pacific Coast aircraft manufacturers' manpower problem is one of large shortages of "mass personnel" and numerically smaller, but more critical shortages of "key personnel." This latter group includes nearly 58,000 men, a large percentage of whom are engineering, tooling, inspection and administrative kingpins, many now subject to military induction.

Deficiencies in "mass personnel" now have reached "serious proportions," the panel declares. Turnover is the great obstacle to adequate "mass personnel." And the report here points out that of the 150,435 new employees hired in the first six months of 1943, only 20,291 remained on the payrolls at the end of that time.

It further is warned by the panel that personnel is deficient in qualifications and experience, as well as in numbers; that deficiencies in numbers and qualifications of personnel have increased, despite extensive efforts to recruit, train and retain employees; and that utilization of manpower has increased greatly, through improved engineering, production planning, tooling and supervision.

"But even these measures have not been adequate to meet the counter-forces reducing the numbers or thinning the quality of the working force," the panel cautions.

Catalogued vividly in the report are the "counter-forces" that are causing terminations.

Among the women workers, marriage, pregnancy, child care and the desire to be with their husbands are the principal reasons given for quitting their jobs.

Among the men, it is mandatory military induction, leaving to obtain better jobs and wages and to return home.

Causes for termination have been divided into six categories: Military, health, working conditions, living conditions, personal affairs and dismissals. Whenever an aircraft worker signifies his intentions to leave, a company counsellor endeavors to ascertain from him the exact reason and then lists it under the cause.

One of the most recent summations, or break-downs into the causes of job terminations by the men and women workers, was made for one month late in 1943, by the panel. The situation might have changed slightly by this time, because the maze of reports from which the summary must be made are so intricate and complete that the statistics

(*Continued on page* 94)

Employees who resign are interviewed (above) in effort to learn cause of leaving. Company counsellor (below) advises new worker on solving transportation problem.

# NEEDED— A DEPARTMENT OF WAR

By

Adm. H. E. YARNELL, U. S. NAVY (Ret.)

*An eminent officer urges three sub-departments of Army, Navy and Air under a Secretary of War.*

*The author's broad experience qualifies him to speak on this controversial subject. He served in the Spanish-American War, the Boxer Rebellion and the World War. He commanded the carrier Saratoga and aircraft squadrons of the battle fleet. His article first appeared in the U. S. Naval Institute Proceedings in August, 1943.*

WHEN the war ends, one of the major domestic problems will be the demobilization of the great military forces and the disposition of the vast amounts of armament — ships, guns, tanks and planes — far in excess of what can be kept in active commission.

Due to the development of new weapons and changed methods of warfare, there will also arise the question whether the present organization of the War and Navy departments is adequate to meet the problems involved in maintaining the peacetime military force in a state of readiness for future contingencies.

One outstanding phase of the war to date is the necessity of close co-operation of all services in military operations. Land, sea and air forces must work together as parts of one machine in order to ensure success. This has been especially true in the Pacific, and also in the Mediterranean where the British navy played a major role in the expulsion of the Axis forces from North Africa.

The question also arises whether or not a thorough reorganization of our military departments is essential in the interests of efficiency and economy. What organization of our military forces will produce the most efficient fighting machine?

Naturally, any radical changes in the present organization will meet with strong opposition from conservative elements and intrenched interests, but the welfare and future safety of the nation should be the determining factor.

There are three courses which may be followed:

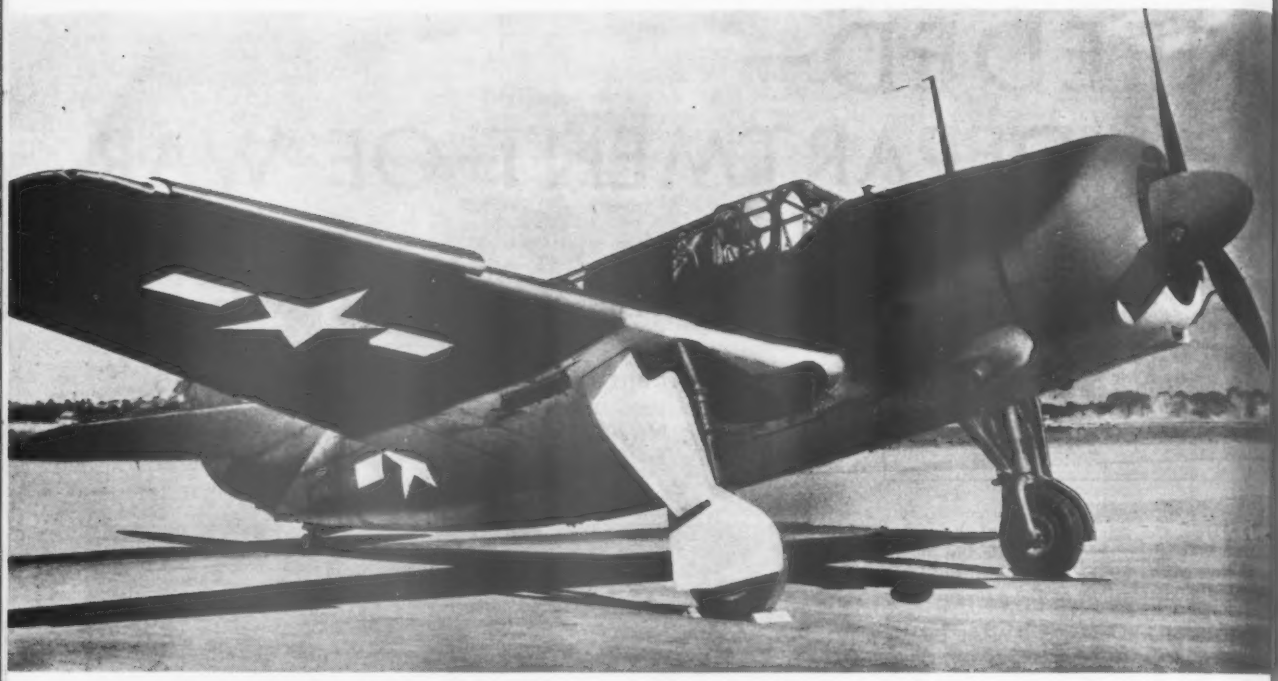
(a) Retain the present organization.
(b) Provide for three departments—Army, Navy and Air.
(c) Combine all three arms into one Department of War.

The present organization of the War and Navy departments have been the result of many years of experience and of slow development. They have virtues and defects. It is noteworthy that rather drastic changes have been made in both departments as a result of the present war.

Each department plans for war in its

(*Continued on page* 150)

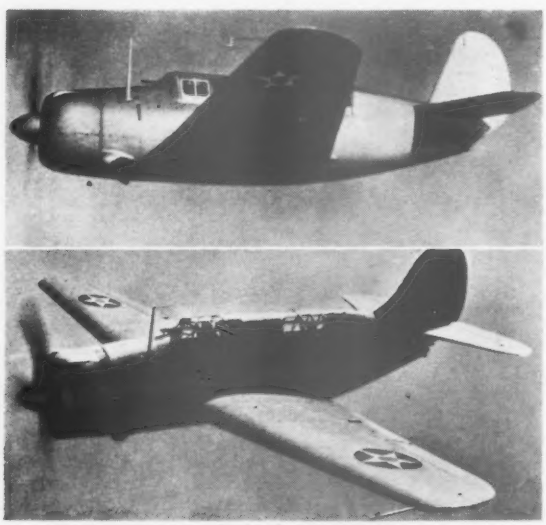
President Roosevelt decorates Admiral Yarnell with the DSM on his retirement as commander of the Pacific Fleet in 1939.



Production model of Helldiver (SB2C-1C) is built at the Curtiss Columbus plant. An AAF and Australian modification (A-25) is produced at Curtiss St. Louis factory. Note stall-preventing leading edge slots in the wing.

# HELL-

AFTER years of specification and structural changes, elaborate tests and redesigning, the Curtiss *Helldiver* finally has gone into action. Powered with a 1,700 h.p. *Cyclone* engine, its top speed is in the vicinity of 300 m.p.h. Normal range of this two-place dive-bomber is 1,200 miles; service ceiling is 25,000 feet. Its heavy bomb load is carried internally. First picture in this country of the *Helldiver* in combat was taken by FLYING's W. Eugene Smith during Rabaul attack on November 11. It ran in February issue, but with *Helldiver* deleted by Navy.



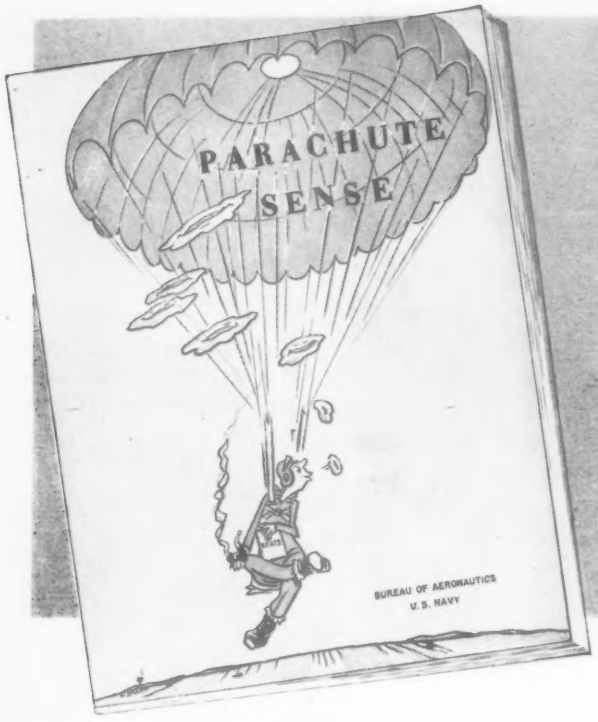
Two experimental predecessors of the present Helldiver show numerous modifications in tail and nose. Note that two nose guns on prototype do not appear on current type.

This FLYING photograph appeared in February issue, but with Helldiver (upper left) deleted. Avengers are in foreground.

Area of the large wing is 422 sq. ft., span: 49 ft. 8 in. Rear-seat man operates radio and flexible guns.

The chord of the Helldiver's wing and horizontal tail surfaces is unusually deep. Tail wheel no longer retracts. Carrier arresting gear hook is in rear fuselage tip.

# DIVER




# PARACHUTE SENSE

*The pilot training programs of both the Army Air Forces and the U. S. Navy Bureau of Aeronautics have been distinguished by the originality and readability of training texts, prepared for the services by professional artists and writers. "Parachute Sense" is one of these training booklets and is published by FLYING as an outstanding work of this type. In introducing the booklet to the Navy pilot, the Bureau of Aeronautics strongly stresses that "all this booklet will do for you is picture generally when and how to go over the side, what happens when you do—and why it happens. It will also give you the corrective procedures for the things that could work to your disadvantage during the process."*

YOU'RE on your way to being an accomplished flyer. More than that—an accomplished combat flyer. You know what that entails—airmanship, seamanship, gunnery, navigation, radio and more than a casual knowledge of your power plant.

It also entails something else: the responsibility on your part to remain alive to use the education given you in these branches of war aviation. You represent a lot of investment—you're a valuable property. So be a good fellow and don't knock yourself off through (a) being unaware of the necessity of leaving your ship the instant you know you can't bring it in safely, (b) not knowing how to get out, or, (c) not knowing what to do after you get out.

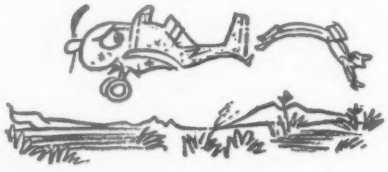
It's not likely that you're going to have much time to ask questions when the idea of leaving your aircraft first stirs around in your brain. If you're a pilot, you're supposed to tell your gunner or crew when to bail out—not ask them. If you're alone, it won't do you any good to ask the Gremlin that got you into trouble in the first place. He's a pretty mean little guy. He won't tell you. He gets kicked out of the Gremlins if he opens his mouth.

So you see, it's entirely up to you. And your problem divides itself into four convenient phases:

The decision that bailing out is necessary.
The act of leaving your plane.
The procedure during descent.
The landing.

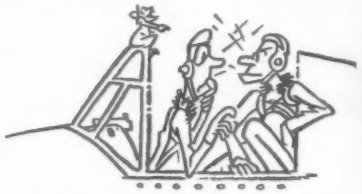
It's no news to you that in cross-country flying you are constantly prepared for your engine to cut out. This doesn't mean that you get into a psychopathic state of worrying about it—instead, you do the sensible thing and keep track of the wind direction, the nature of the terrain, the closest landing field and your altitude, so that you can immediately start your forced landing without having to dope out those factors.

Way back in your mind, tucked away somewhere so it doesn't interfere with your concentration on the problems at hand, you should carry the same expectation of the necessity for bailing out. In other words, you should at all times be conscious of your altitude, the actual attitude of your plane—whether horizontal, diving, spinning, inverted or standing on a wing tip—and your air speed. Because: your altitude determines whether you are high enough to bail out with safety and the technique



to be employed; the attitude of your plane determines how to leave it with safety at that instant; your air speed determines, to a great extent, how long you must wait before you pull your rip cord. (You should wait until you have lost your forward speed, after bailing, if altitude permits.)

With these factors fixed in your mind, you have the known quantities governing your physical ability to bail out. Now let's assume they're okay—you can bail out of you decide to. The important thing is to come to your decision immediately and follow through with it immediately without engaging in any fascinating debate with yourself about



it. All you'll do is lose time if you argue.

The circumstances under which jumping becomes a necessity are much too numerous to cover here. So if you find yourself in a situation some day where you're making up your mind, don't say to yourself, "This wasn't mentioned in that brilliant little booklet—so I guess I don't bail." As the boys pick you up they'll look at each other with that tiresome old sentence, "Why didn't he bail out?" This makes them dull conversationalists, which is bad for morale. For the sake of your friends concerned, see that this doesn't happen.

It's never too late to jump? Is that what you think? If it is, you can get that idea right out of your helmet. However, if you press for an answer to the question, "How long can I jump and still be safe?" that's a fairly tough one to answer. The only reply that makes any sense is: The lowest altitude from which it is safe to jump from a plane is the lowest altitude at which your chute will open early enough to permit a safe landing.

Several considerations govern that minimum altitude:

(1) The speed of the plane.

☆

*The proper technique of bailing out when emergency demands immediate action is being taught Navy pilots in a unique "learn with a smile" program.*

☆

(2) The attitude of the plane.
(3) The amount of control you have of your aircraft.
(4) The length of time which it takes your 'chute to open and check your rate of fall.

Figuring out these governing factors is mostly a matter of common sense. If you have pretty good control of your plane in spite of whatever failure has taken place; if that failure has occurred, say, around 200 feet; if the terrain is such that you don't figure on smacking into the side of a mountain, and the only thing you're *sure* of is that your plane won't spin you in—it would be silly to leave it at that altitude. Even a crack-up on your landing would be less risky than getting out.

If, on the other hand, you're coming down like the hammers of hell in a spin or a power dive, you've lost control at too low an altitude, and you're a cinch to be spread all over the landscape on your arrival below, but at 200 feet you can still get out—then git!! Flyers have jumped from 30,000 feet down to 150 feet and from all altitudes in between, with full safety and with no ill effects. However, in other instances even 250 feet has not proven enough altitude—due to the 'chute opening too slowly, and the downward speed being too great because of the downward velocity of the aircraft when the pilot jumped.

So no hard and fast rule with regard to altitude can be given, except a few general statements: Delayed jumps—in which the pilot permits himself to fall a certain distance before pulling the rip cord—have certain distinct advantages:

(a) In combat, you are a beautiful target for enemy airmen while floating down, calm and serene, under your sky umbrella. So the further you can drop without pulling your ripcord, means the faster you'll get out of some enemy flyer's line of sight.

(b) If you have to bail out at 25,000 or 30,000 feet, where lack of oxygen and cold are a factor, you want to get out of that upper stratum of air as quickly as possible, to avoid anoxia and frost bite. Here again, then, a delayed jump is an excellent idea—but you want to be careful not to wait too long, so that lack of oxygen won't make you incapable of pulling the ripcord, or holding your breath.

Normally, a 'chute opens in about two seconds after pulling the cord. However, you're still falling too fast for a safe landing for a few more seconds, and a 'chute that hasn't been repacked in some time takes a little longer to open. So don't forget these factors in low jumps.

If you want to play it absolutely safe, allowing for all factors, get out and have that ripcord pulled by 1,000 feet!

Generally speaking you're faced with the necessity of going over the side because of—

(1) Loss of control of your plane due to:
  (a) Structural failure.
  (b) Inability to recover from a maneuver.
  (c) Collision.
  (d) Violent weather or fuel exhaustion.
(2) Engine failure at night, in fog or over bad terrain.
(3) Fire.
(4) Weather conditions which have resulted in your being hopelessly lost with no visibility.
(5) Enemy gunfire (combat or AA),
(6) Or a combination of two or more of these conditions.

For instance, you may find yourself suddenly unable to regain control of your plane from a spin or a steep dive, and the cause may be a structural failure rather than only your own inability to pull out. In this instance you won't, of course, want to waste time worrying about why you're not getting control. Naturally, if you have enough altitude

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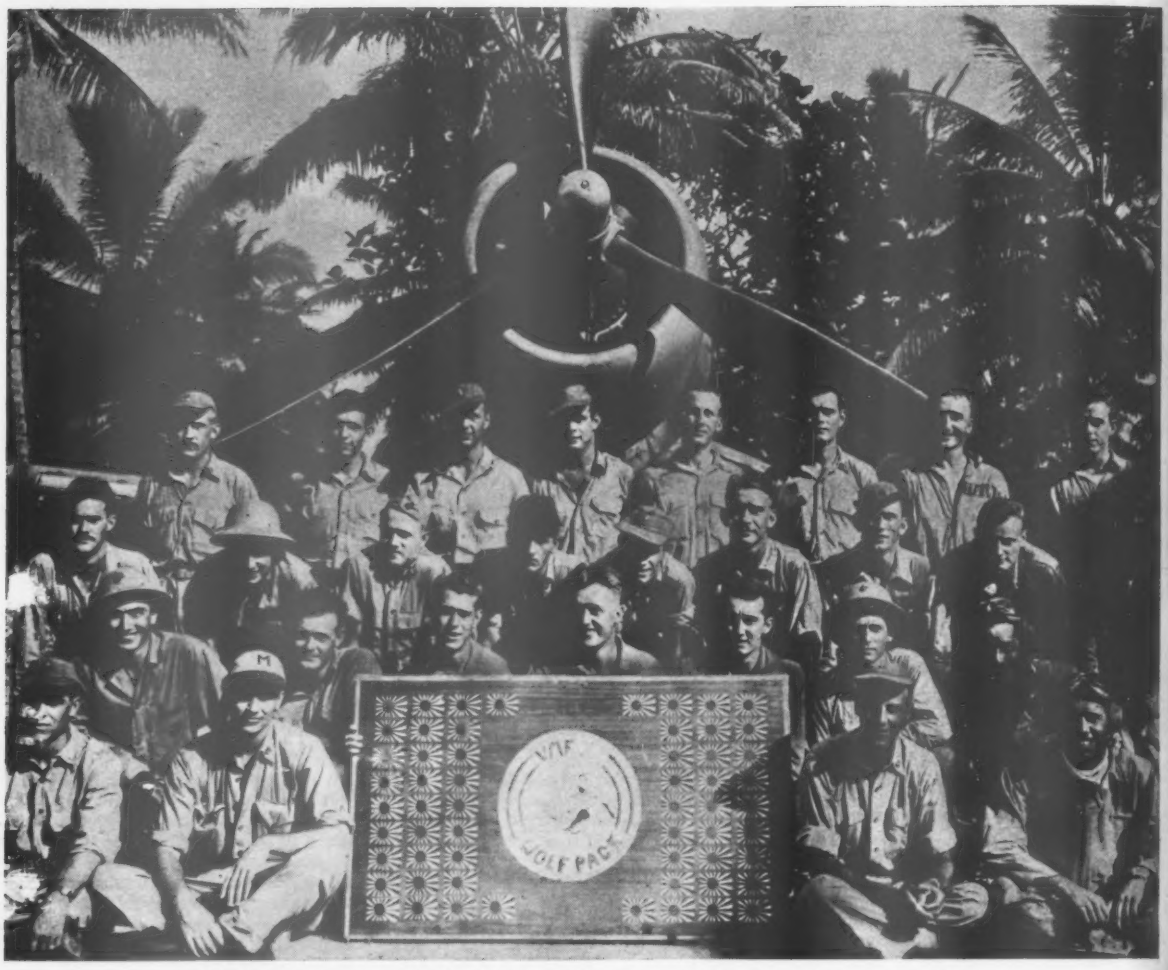


The Marine Corps' famous "Wolf Pack," officially known as VMF-112, pictured at the point where their tally board showed 58 Jap planes downed against a loss of but one of their craft.

# WOLF PACK

*This squadron of Marine fighter pilots established a record outstanding in the annals of the service.*

By Lieut.
**RICHARD G. HUBLER**
USMC

THERE were Fontana, Pederson, Secrest, Cleveland and Hurst. Donahue, Laird and Wamel were on their way. Fraser, De Blanc, Percy, Stack, Coahran and Conti would be along. So would Synar, the half-Cherokee.

No one could have guessed they were the cub pilots who would become the Wolf Pack, one of the three-star fighter squadrons of the Marine corps in the South Pacific.

Then, in late 1942, they were an anonymous VMF squadron: V for aircraft, M for Marine, F for fighter. It would be eight months before this group of boisterous boys in their middle 20's would become famous in the fighter squadron annals of the Marines.

They were heirs to a formidable tradition. Maj. Joseph J. Foss, 26-plane ace, and his squadron had posted an official kill of 111½ Jap planes during the first months of Guadalcanal. The squadron of Lieut. Col. Harold W. Bauer was credited with more than 90. That of the twin aces, Capt. John L. Smith and Capt. Marion Carl had notched 83. The squadron led by Maj. Robert Galer was close behind.

But before this squadron was through it was to rank third in that galaxy. It was to knock down 86 Jap planes during nearly 18 weeks of combat duty, twice the grueling tour of any previous fighter group.

This was to be accomplished without the creation of any lone wolf aces such as Foss or Smith. It was to be made in the days of late 1942 and the first part of 1943, when fewer Jap planes raided Guadalcanal. It was to be done almost

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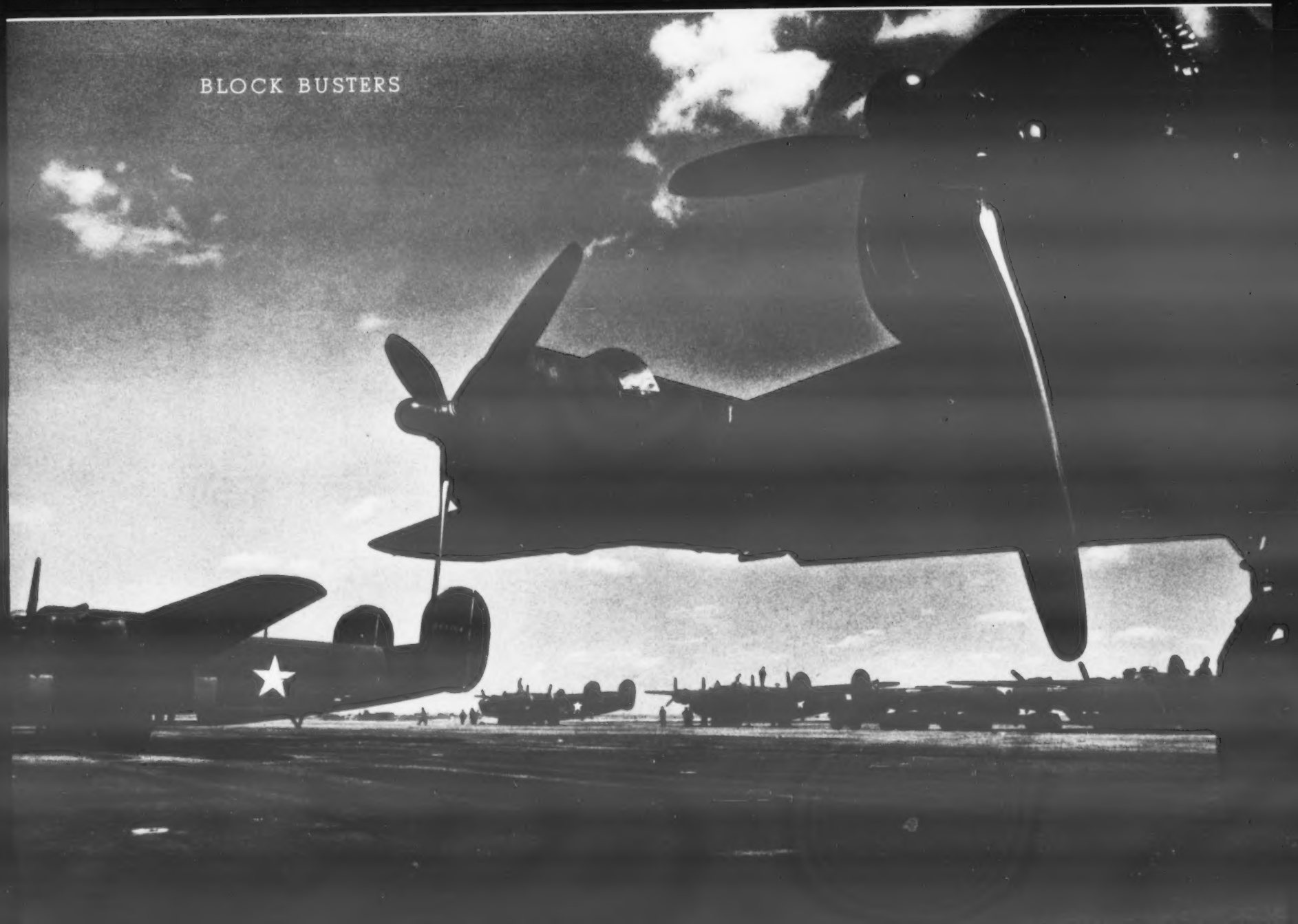
WARMING CORSAIR


BLOCK BUSTERS

NIGHT WATCH

"YANKEE DOODLE"
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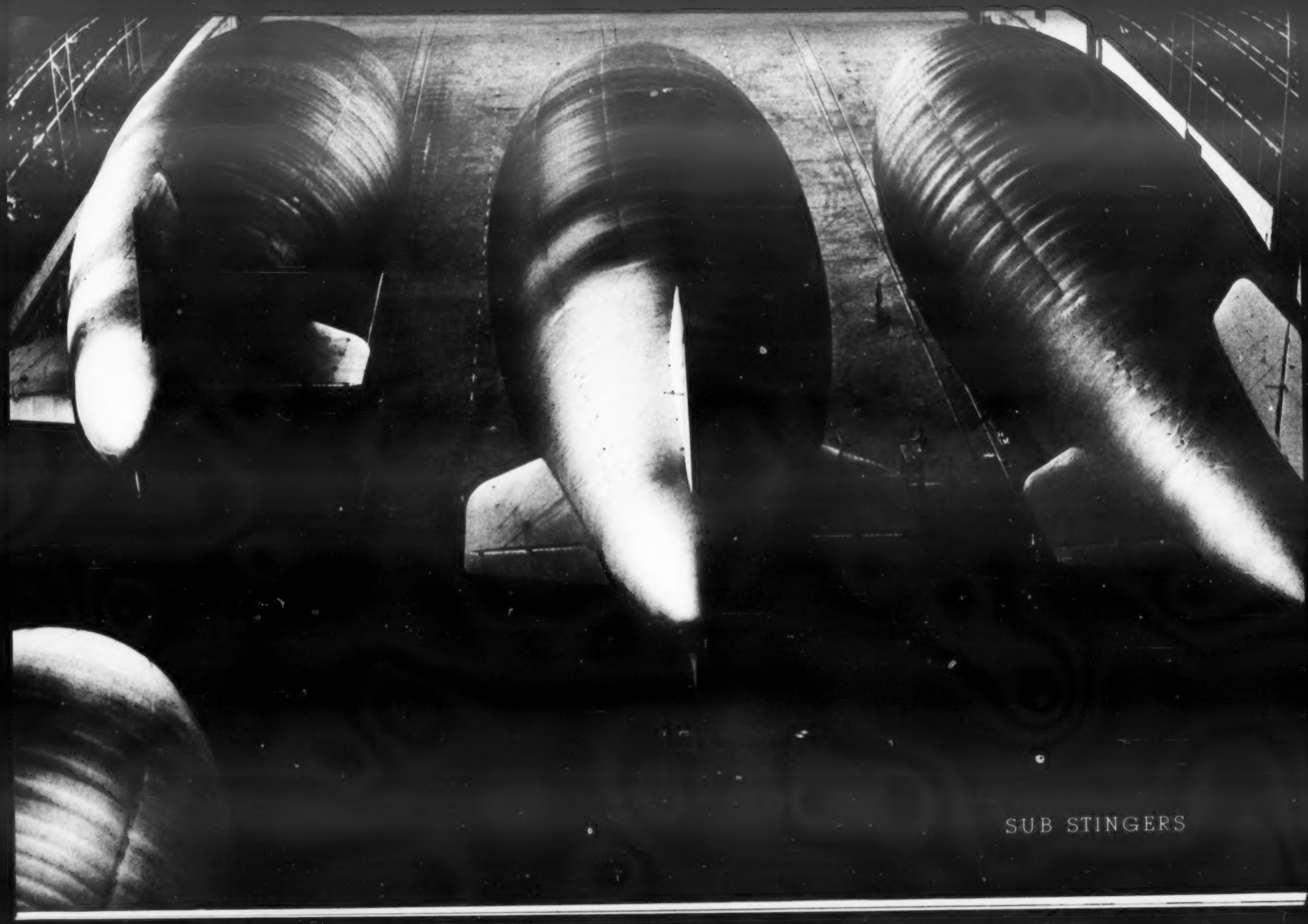

SUB STINGERS

PRODUCTION WARRIOR

HOUSEWIVES, 1944

# TURRET TEST

# ARMAMENT TEST TUBE

By CHARLES STARRETT, Jr.

*The armament of our high-altitude warplanes now can be ground-tested under conditions simulating actual flight.*

THE largest high-altitude test chamber in the world—capable of simulating heights up to 60,000 feet and temperatures ranging from 85° below zero to 175° above—now is in operation in the armament laboratory at Wright Field, Dayton, O.

Constructed for the specific purpose of enabling the Army Air Forces' experts to further improve the armament and equipment of our high-flying combat aircraft, the test chamber took a year to build at a total cost of more than $68,000.

There are hundreds of high-altitude chambers (a number at Wright Field) scattered over the country but this intricate unit just put into service at this field is unique.

Most test chambers are round like giant tubes, but almost all of them are built on their sides, permitting entrance through doors built in the closed-up ends. This new chamber of the field's gun and bombing technicians is set on end, with the ends closed.

More than two years ago electrical engineers in charge of high-altitude test work in the armament laboratory, conferring with the branch chiefs of that laboratory, decided that existing low-pressure chambers were unsatisfactory. They needed a big one, one in which they could test large pieces of equipment—turrets and large guns—at extremely high altitudes.

They had been ordered by Washington to perfect the best aerial guns and other armament equipment in the world—and they needed a test chamber with which to make sure their work was just that.

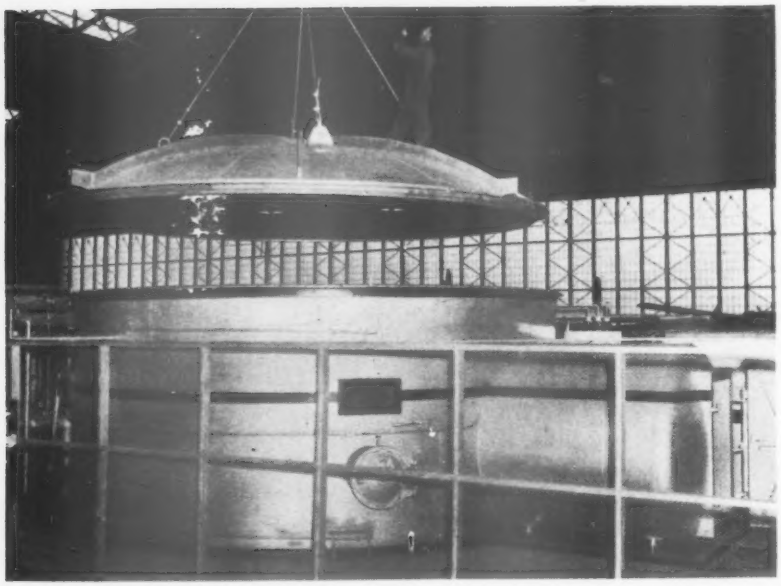
Plans were drawn and approved and in August, 1942, construction began in one of the field's huge new hangars near the flying line. The huge chamber was recently completed and put into immediate service.

E. M. Ehlers, engineer in charge, explains that "with this new test chamber, we can find out exactly how guns, turrets and other mechanical armament equipment work under every condition—heat, cold and at altitudes even above that flown by our present planes."

Thus far, Ehlers and his technicians had run four tests in the chamber—one high-altitude "flight" and three cold tests. Everything worked perfectly.

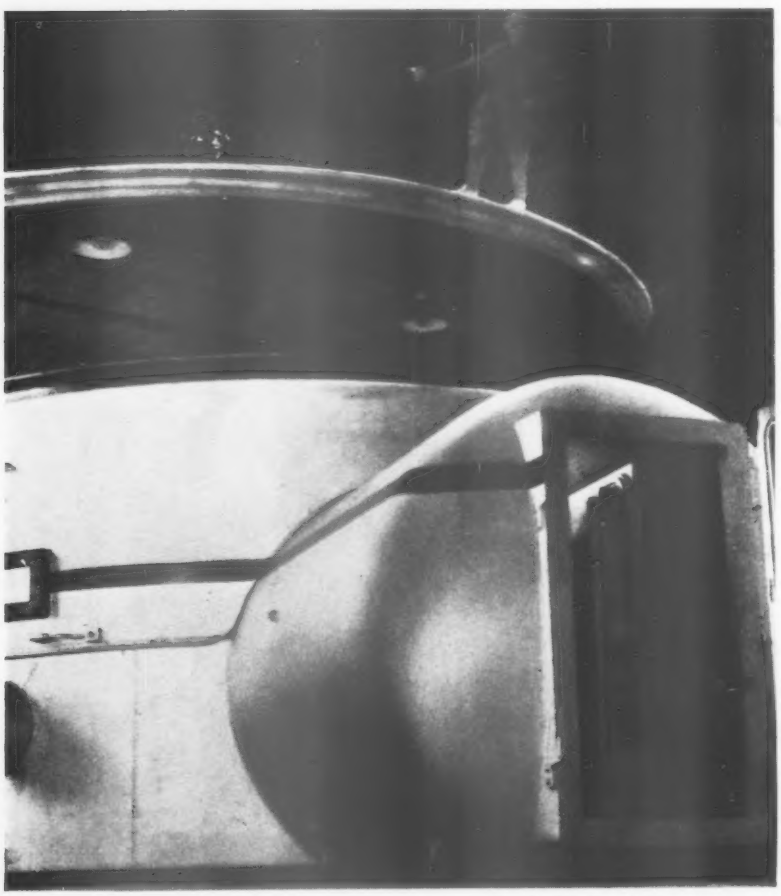
Once, after Ehlers was "flying" several miles above sea level, testing for air leaks in the new chamber, he was strick-

Engineer E. H. Wehlers, at control panel, checks test progress through window.



Chamber is 20 feet in diameter, 16 feet high. Its roof weighs 10 tons and can be removed to permit installation of large units of armament undergoing test.

★ ★ ★



Before entering chamber when interior air pressure has been altered, engineers first stop in this air-lock where pressure is gradually adjusted to same point.

en with bends. "That's nothing, it can happen to the best of us. There's not much to worry about," the engineer scoffed.

The big "can" is 20 feet in diameter and 16 feet high. Its walls are of three-quarter-inch steel with 12 inches of insulation inside. The top, removable by a special crane so as to permit the installation of large pieces of equipment to be tested, also is made of steel and weighs 10 tons.

Two large vacuum pumps are used to draw air from the cylinder, thus reducing the air pressure inside the chamber to the low atmospheric pressures of altitudes exceeding 10 miles in the air. These pumps can enable the chamber to "climb" from sea level to 40,000 feet in 15 minutes and to 10 miles in 21 minutes.

Four electric fans in front of electric heaters, which turn out 40 kilowatts of heat, enable the chamber to be heated far above the temperatures encountered on even the hottest desert. A two-stage freon refrigerator sends the liquid through coils in the walls of the test chamber to send the mercury in the opposite direction. It takes seven and a half hours to "pull" the temperature to 75° below zero, Ehlers explained.

To enter the gray-painted cylinder, operators and engineers enter an air-lock. They walk directly into the chamber when the pressure is that of the surrounding air or must be "sent up" in the airlock before entering the main section if the chamber is "in flight."

Once inside, you quickly attach your oxygen mask to long tubes found along the walls. If you didn't use the mask at 40,000 you would lose consciousness in a few seconds. Once your mask is working, you plug your interphone in a socket in the wall which connects you with the operator outside. If it's cold, you don an electrically-heated flying suit and plug into the electric heating circuit.

Now you're ready for work. Last week, technicians were testing new installations on a *Liberator*-type tail turret. The engineers "took" the chamber to 45,000 feet and held it there while a soldier, dressed in flying togs and mask, moved the turret this way and that.

Outside the chamber, one man stood at the chamber's controls, ready to "bring it down" at the first sign of trouble. Other engineers stood at glass ports in the cylinder observing closely every movement inside. The equipment functioned as it was supposed to and another perplexing problem had been solved, for the test had been completed under the exact conditions which would arise when the apparatus is used in a high-flying plane.

From Col. F. C. Wolfe, chief of the armament laboratory, came the explanation for the need of such a large test chamber. "We have many high-altitude chambers and cold rooms at Wright Field but none of them have been of sufficient size to be used both for humans and equipment as well with any degree of satisfaction. This chamber has solved a lot of our problems." END

Cockpit of Halifax four-engined bomber designed for single-pilot operation. Bombardier is shown below.

# CO-PILOTS for Bombers?

*Short of trained men and pressed for time, the RAF has found that a single pilot can handle its heavy bombers satisfactorily.*

☆

FOUR-ENGINED bombers of the Royal Air Force Bomber Command have not carried co-pilots for almost two years. Following successful experiments on the possible elimination of the second man in the office of such planes as the Avro *Lancaster*, Handley Page *Halifax* and Short *Stirling*, the RAF developed the one-pilot bomber idea to overcome the dual shortage of pilot material and training facilities

Late in 1941 the Bomber Command was assailed by acute shortages of manpower, material, and—above all—time. There was too much lag between the moment a pilot began training and the moment he met the enemy. There weren't enough pilots to go around. Planes vitally needed in combat were being held for training, not only of pilots, but of co-pilots. And with the Luftwaffe pressing for a decision on every front, time was of the essence.

Everyone in Bomber Command was agreed that they must hold the island fortress that is England until the United States could mobilize and train re-inforcements, and build bombers. But how?

Thus — mothered by necessity — was born one of the most daring ideas of the war—multi-engined bombers with only one pilot.

It was not born without opposition and not allowed to live without more opposition. Many experts opposed it in the beginning. Its advocates persisted and necessity strengthened their case.

They disclosed through research that, in two years of actual warfare, there were only four cases where co-pilots actually brought back their aircraft after their captains had been killed.

But this interesting figure popped up on the other side of the ledger: in the same two-year period a relatively very large number of pilots were killed in training, not to mention the great number of combat aircraft that were kept from the fighting front by training requirements.

A lesser factor, but one nonetheless important from the pilots' viewpoint, was the fact that co-pilots tended to get "rusty" riding on the right-hand side of the cockpit, awaiting their turn for promotion.

At last the experiment was approved. It was decided that pilots would be trained for multi-engined bombers on the premise that no co-pilots would accompany them when they were ready for combat.

The experiment proved an unqualified success (a) in reducing the number of pilot casualties and (b) in increasing the tactical efficiency of the pilots.

The British are the first to point out that the idea is not one which could necessarily be applied to the U. S. Army Air Forces. The necessities here are not now, nor ever have been, as pressing as they were in England in the year of 1942. We still have plenty of trainees and the planes are coming off the line in greater numbers every month. Furthermore, conditions under which our bombers fight always have been different from the British. The RAF bombers work, generally, by night; the AAF by day. And the trend of the air war is toward more combat during a bomber raid—the duties of a daylight co-pilot are numerous and, at times, of the utmost importance.

But the one-pilot system was a fortunate innovation at the time it was devised and it has worked out so successfully that the British plan to continue it throughout the war. They still face a shortage of men; training space and facilities, if not training planes, still are at a premium. Another factor for leaving well enough alone is that the present training system would have to be revised radically if a co-pilot were returned to the big bombers.

Today, the way the system works is this: seeding candidates for bomber pilot training has become highly selective There no longer being the necessity of filling co-pilot rolls, only the best of the candidates are entered in the bomber schools. With co-pilots out of the way so far as use of planes is concerned, training can be far more intensive. Unhampered by the fact that a co-pilot also has to have his time in the air, first-line flyers are able to spend more time per day aloft and complete their course without going stale between flights.

Added to the training is extra time for ground and flight work with "George" (the British name for the automatic pilot) and key to the fact that one pilot can swing a big plane on a long flight without collapsing from fatigue. Once on his course for Germany, he can turn the controls over to George and relax until time comes for the run on the target, when he takes over again. The British point out that the command pilot always took over formerly for the bomber run, so that the

(*Continued on page* 168)

The Japs built this excellent Guadalcanal field—now an important U. S. base.

# RECLAIMING ENEMY AIRDROMES

By WILLIAM S. WOODRUFF

*Our airborne engineers land on enemy runways as soon as the foe retreats, and restore them for our own use.*

WHILE our tactical and strategic air forces are doing a job destroying enemy airfields, our airborne engineers throughout the world are doing a very tidy job in repairing the destruction and making those airfields useful to our own planes just as soon as they fall into our hands. According to the report of Brig. Gen. Stuart C. Godfrey, U.S. Army Engineers, Army Air Forces, recently returned from a trip to all war theaters, we have a distinct edge in this factor of logistics.

We learned our first lessons from what the British did in the Blitz. The Luftwaffe's attack on Britain in 1940-41 might have been successful, as it was in Poland and France, had not the British learned to keep their defensive fighting fields operative. Britain's gallant little band of fighter pilots could keep going because British ingenuity and foresight kept the fighter fields open for them every day, no matter how serious the damage done by the raiding bombers the night before.

First of all, the British had established these fields in such widely dispersed patterns that the Germans were never able to bomb any large number of them at any one time. Stored near each one were ample stores of gravel, cement and fill, with trucks and road machinery to place the repair materials. The Germans were never able to strafe fighter opposition out of existence in England as they had done in Poland and France.

There is ample evidence, of course, that the Germans learned that lesson. No matter how heavily our own medium and light bombers nowadays strafe German fighter fields in the low countries, France and western Germany, new fighter planes always seem able to rise against the heavy bombers when they go over. The number of those fighter planes is being cut down in combat, it is true. But with stores of material always at hand and with plenty of slave labor to command, the Germans seem always able to restore the fighting fields, even if they cannot restore the fighting planes.

They were, however, not able to hold this advantage in Africa and Sicily. Their control of Italy seems not quite strong enough for them to assure quick repairs there, either. And in other theaters of the war, notably the Pacific where the Japs seem notoriously short on airfield machinery, the presence of our airborne engineers behind every advance has given us a distinct advantage.

From Guadalcanal to Bougainville, these boys have been in there with their new types of light airborne road machinery, providing usable strips for our fighters and bombers within days, sometimes within hours of the time our men have taken possession. Sometimes they

Using tractors delivered by air, Army engineers fill bomb craters with earth.

have reconditioned enemy flight strips which our airmen had made useless to the enemy but a few hours before.

These airborne engineers were organized first in the summer of 1942. Within six months they were ready to land with the forces in North Africa. Now, with more than a hundred battalions and separate companies, they are ready to go in all over the world. They were chosen from the Air Forces for their durability and special skills. Their training was about the most rigid that the Army was able to devise.

It began with combat training—for the engineers have often had to fight for what they were building—and it went on through training in the use of their special machinery and weapons. Some were trained to find and remove mines; some became headquarters troops, some topographic experts and some camouflage men. But all of them learned to use the sub-machine gun, the .50-caliber machine gun, and the mortars and field guns that nowadays can be transported by air.

Along with this training went the development of special machinery. American industry was invited to devise lightweight bulldozers, scrapers and rollers of measurements that could go into transport planes capable of landing under the most rudimentary conditions.

All of this machinery cannot yet be described. But, typical of the contributions of American industry to this problem, is the airborne bulldozer. It weighs but 4,200 pounds and packs, for air transport, into 201 cubic feet of shipping space. Yet it can push from five to 10 cubic yards of earth ahead of its blunt blade.

Its job is to fill bomb craters. An average hit by a 1,000-pound aerial bomb on a runway will make a crater 45 feet in diameter and 14 to 15 feet deep. It will displace some 300 cubic yards of earth. A few hours' work with such a bulldozer can refill a 1,000-pound bomb's crater.

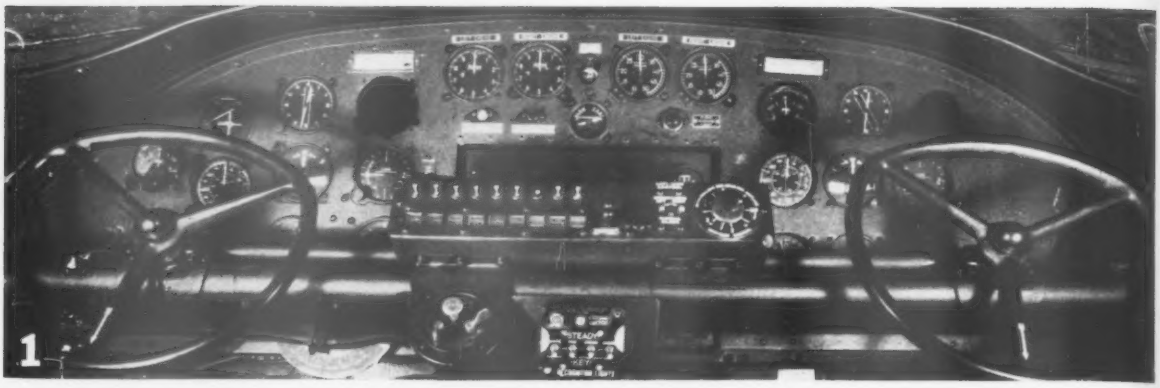
Similarly, light, handy road scrapers, air compressors, rollers to be filled with sand or water, portable lighting units and portable water purifiers have been designed to fit into cargo planes and even into gliders. With such equipment readily available it takes but a short time to get forward airfields into operation.

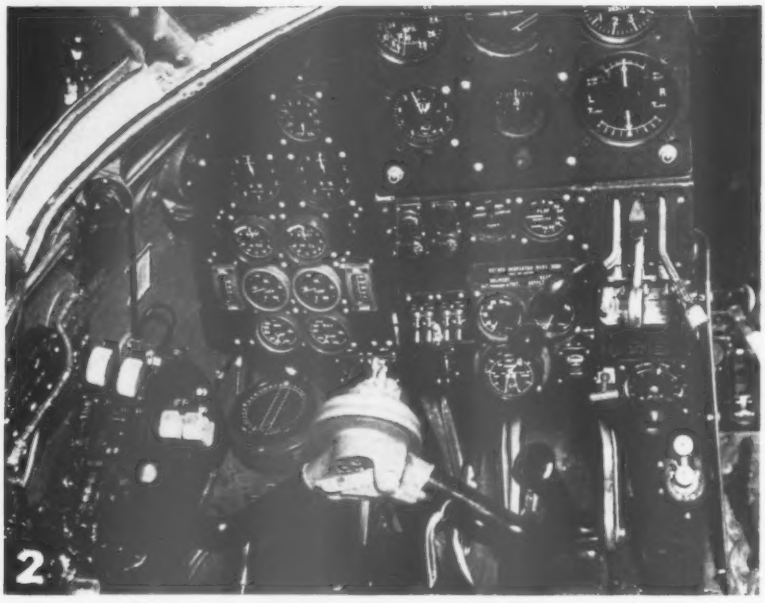
"I was particularly interested in the job our boys did on a fighter field in New Guinea," General Godfrey says. "When we got at the site, it was just 40 miles from the Jap lines. It was inaccessible except by air. An entire airborne battalion of engineers was flown in, complete with bulldozers, graders, compressors, jeeps and the guns necessary to defend it. Within three weeks this field was in use to help capture Wewak and Lae.

"Native labor had cleared enough ground for the first *Skytrain* of the Air Transport Command to get in. The first of the 19 bulldozers and 32 jeeps, graders and scrapers ultimately delivered,

(*Continued on page* 164)

Among war booty captured in New Guinea was this road roller, now serving Yanks.

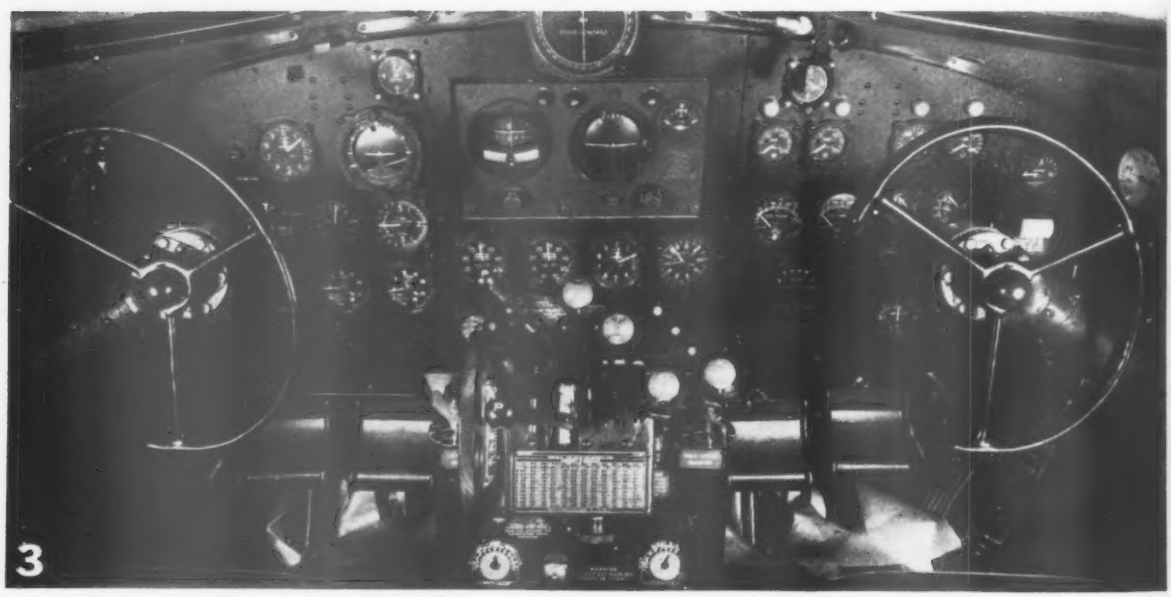



# PILOTS' PUZZLE

★

DEDUCING the identity of airplanes by studying photographs of their cockpits has the makings of an interesting game. With a little shrewd detective work in tracking down the multitude of clues in each picture (such as cockpit layout, type and position of controls, instruments, etc.), the reader should be able to guess at each plane's identity. The answers are on page 172—but don't give up until you have examined these photos carefully.



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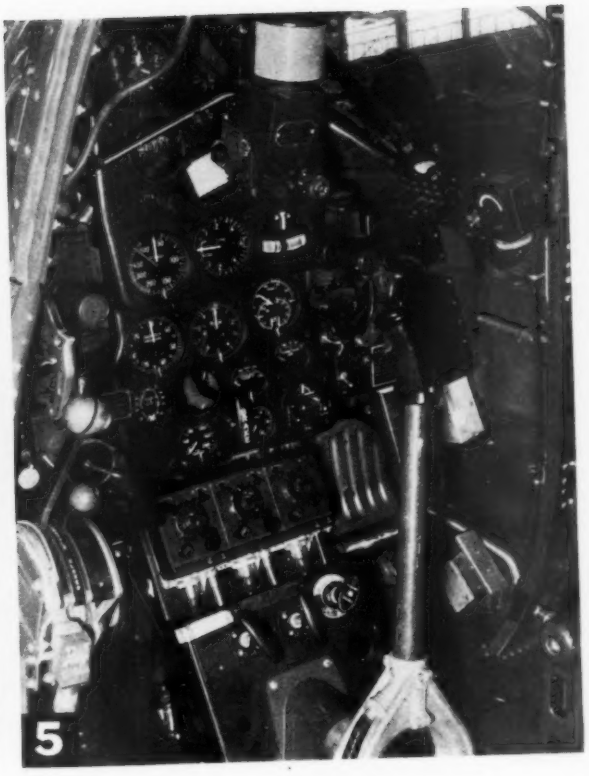

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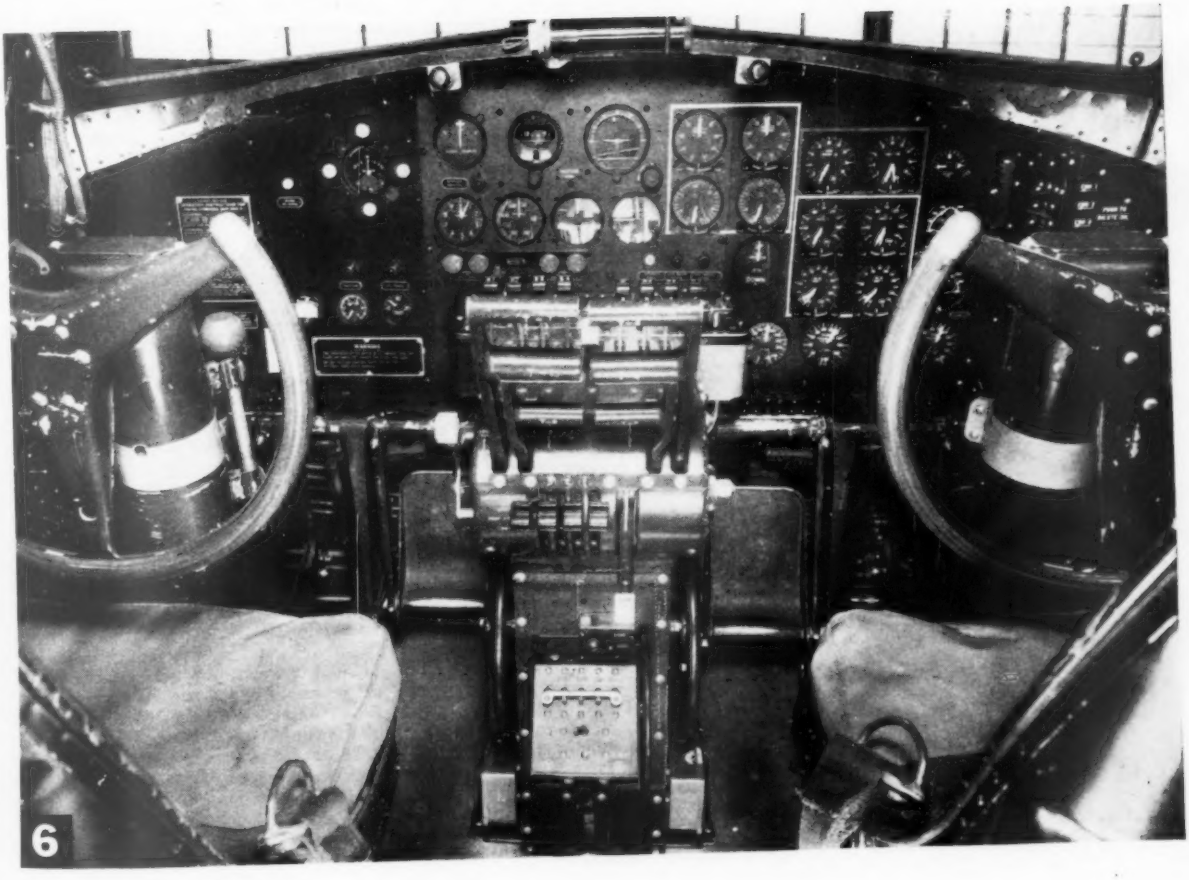

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Field Marshal Goering decorates members of the Condor Legion which fought in the Spanish Civil War with medals specially designed by Hitler himself. The Spanish war was used by the Nazis to test their air combat techniques.

# The LUFTWAFFE

By JO ELLEN ADAMS

Luftwaffe officer's parade uniform, on left; general's service uniform, right.

*The Luftwaffe contains the cream of Germany's manpower, carefully trained since boyhood to become tough, resourceful, disciplined fighters.*

"BE my brother or I will bash your head in" is a German proverb that was made to order for the Luftwaffe during the days of its first easy successes in Poland, Norway, Flanders and Crete.

The air forces of the United Nations have since done a convincing job of making the German flyers forget mottoes and fight for their lives, but there was and still is bone and muscle behind the Luftwaffe's song of invincibility, and although the music has faded, the German flyers still are tough and formidable foes.

Long-time, meticulous planning made the flying force of the Nazis what it is today.

As long ago as 1934, the Reich Ministry of Education offered aviation instruction to school boys from 14 to 18. Interest of the younger boys was stimulated by model airplane competitions and invitations to air meets of the National Socialist Flying Corps. As the boys advanced in their studies, the curriculum was pointed toward physics, chemistry, the mathematics of aviation and aerodynamics—a sound academic basis for the pilot of the future.

The aviation courses were made desirable in the eyes of the school boy by limiting the number of participants. Only the most talented continued training. There was intense rivalry among classmates to be in the elite group chosen by

local Nazi Flying Corps leaders to carry on with advanced courses.

At 18, after final examinations, the winning pupils were assigned to a Nazi Flying Corps unit.

Shortly after the beginning of World War II, the myth of "opportunity" disappeared from the lips of the Nazi Minister of Education. Aviation instruction became compulsory in all German schools. But the system of selecting the elite persists. The cream of German youth is absorbed by the Luftwaffe.

After passing the final examination at the age of 18, young Nazis are sent to a flieger ausbildungs (pilot training) regiment for purely infantry training. This preliminary course consists of about three months of drill, reconnaissance, patrolling and combat tactics using rifles and pistols.

Trainees are carefully watched during this period and classified according to their abilities and previous activities. On graduation, they are assigned to sound detector, technical or pilot training companies.

The next step for a Nazi pilot is the A/B school. This course lasts approximately eight months. An oberstleutnant (lieutenant colonel) is in command.

Students in a course labeled Az fly approximately 60 hours using Klemm 26's and 35's with 90 h.p. engines, and *Kadets* and *Stieglitzes* with 120 to 130 h.p. engines.

The B1 course includes about 20 hours in the air using various types of aircraft from Gotha Go-145's to the pre-war Messerschmitt Me-109's, Junkers Ju-87's and Heinkel He-123's. The instruction includes 12 night landings.

The last part of the course, B2, includes 50 hours in the air flown on Junkers Ju-34's (one engine) and the Focke-Wulf *Weihe* (two engines), with at least 10 hours of instrument flying on the latter. The *Weihe*, a tough one to fly, is a favorite with Nazi instructors.

Rejected pilots are transferred to ground duties, or they may be assigned to the clerical or airdrome staff. Successful ones are awarded a pilot's certificate (Luftwaffen flugzeugi fuhrerschien). They are then ready for specialized training, either in a bomber or fighter school.

The bomber school has a course of 70 flying hours and lasts, under normal conditions, about three months, but all aviation training courses in Germany now are suffering from lack of fuel. Thus, training time is greatly lengthened or the course shortened. The German air force has, apparently, been reluctant in adopting the latter measure to a degree which would greatly decrease the quality of Reich pilots. A number of intermediary courses designed to keep student pilots from going stale before assignment to the next course have been introduced into Nazi air schools to "control" the flow of personnel. This is indicative of the large pools of potential aviation manpower which are useless to the Nazi air force unless adequate fuel for operating training planes is supplied.

The bomber pilot begins with the Junk-

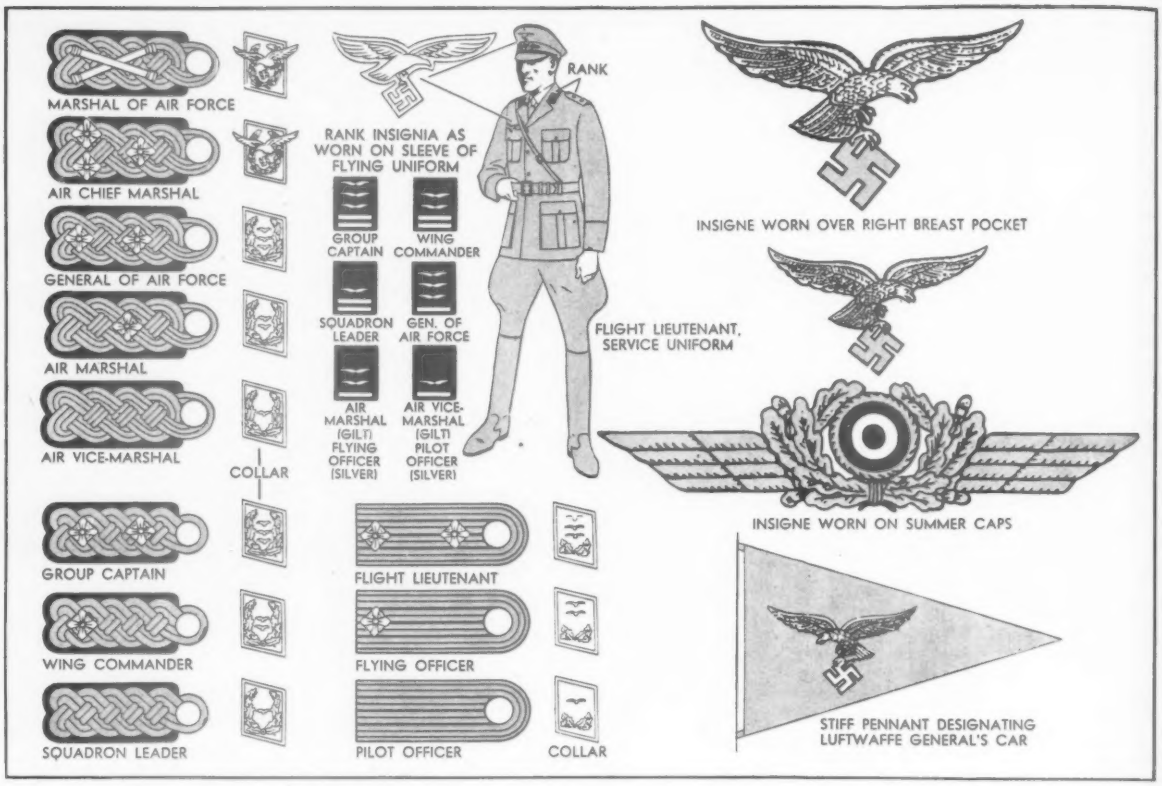
The German flying student's primary training plane may be the Focke-Wulf Stieglitz.

In the first part of his B1 course, the student flies 20 hours in the Gotha Go-145.

Fighter training includes 20 landings and take-offs in the Arado Ar-96B monoplane.

After training in the Arado, the fighter pilot advances to the Messerschmitt Me-108.

The Focke-Wulf Weihe is a favorite twin-engined plane used for instrument training.




Various insigne of Luftwaffe officers. Colors indicating the branches of the air force are also worn by all ranks.

ers Ju-52 or other older types of warplanes. From this he progresses to the Heinkel He-111 and the Junkers Ju-88. The pilots who are selected for long-range reconnaissance fly Dornier Do-17's.

Included in the bomber training course is preliminary work in blind flying and practice in 500 meter (1,640 feet) climbing followed by a 180° turn, without using the automatic pilot.

A special blind flying course lasting six weeks is given to prospective bomber pilots upon completion of the bomber course. This is the only instance in which the Link Trainer is used in instruction courses for the German air force.

There are three kinds of certificates awarded students passing the blind flying course. Certificate 1 is given to instructors and certificate 2 to those qualified to fly in any weather. There is also a "simple" blind flying certificate of an indeterminate nature which is presented to those who are not qualified for certificates 1 or 2.

The jagdfliegerschule, or fighter school, is considered "companion" training to the bomber school, so far as prestige is concerned.

The fighter training begins with landings and take-offs in the *Stieglitz* or Bucker *Jungmann*. Then come 20 landings and take-offs in the Arado Ar-96. The first five are flown dual, the following solo. After this the student does another 20 in a Messerschmitt Me-108.

Formation and combat flying follows. The student fighter pilot is expected to maintain formation at a distance of 250 feet from his instructor's aircraft. Conversion to the Messerschmitt Me-109D and E follows swiftly on the heels of practice in turns. He also flies in formation for about 20 hours with the bulk of practice in 90° and 180° turns commencing from line abreast.

Casualties at German air force fighter schools are extremely high. In 1940, 27 were killed out of a class of 60 pupils at a typical school. Two additional students in the same class had nervous breakdowns.

This extremely high accident rate subsequently has been reduced by cutting down on tight formation flying, but casualties still far exceed those here or among other United Nations' schools.

After the German air force pilot candidate completes his bomber or fighter training, he is sent to an erganzungs-

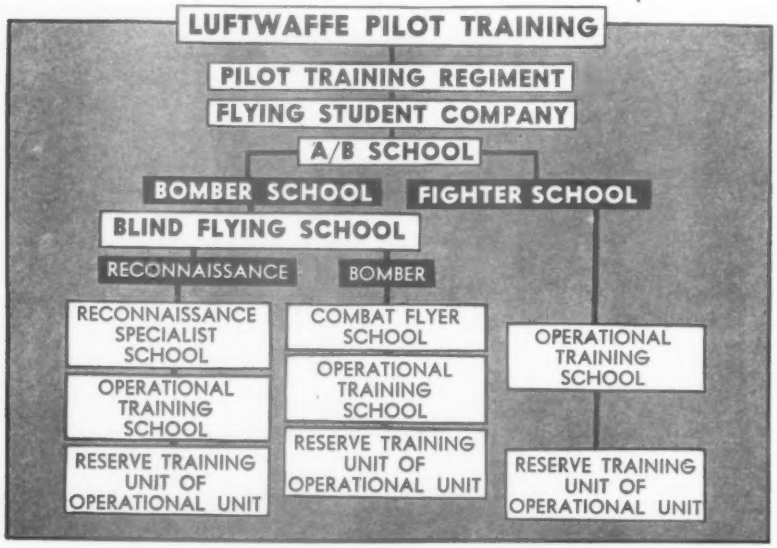



Diagram shows sequence of Luftwaffe training. Beginning at the top, the student passes through the various training steps until he is assigned to combat units.

jagdgruppe, or operational training pool. He continues in intensified flight practice here until assigned to his operational unit.

An officer candidate for the German air force goes a slightly different route. He has to sign up with the Luftwaffe for a period of 25 years. Then he goes through the same pilot training as the enlisted men. In pre-war days, the Nazis, anxious to promulgate the feeling of fraternity between officer and enlisted man, sent the officer candidate back to the pilot training regiment at frequent intervals after he enrolled in the luft krief schule (cadet academy), but this practice has been abandoned in the speed-up training schedule of wartime.

The commissioned rank of leutnant is awarded after 18 months of intensive training during which the student must prove his flying ability as well as pass a rigid written examination covering tactics, the handling of men, administration and general knowledge.

Germany has a large glider pilot reserve in its Hitler Youth Movement and nearly all pre-war airdromes in Germany had their own glider groups. Early in the war, all ex-glider pilots who had not already passed the A/B stage in powered aircraft were suddenly withdrawn from flying schools and put into the glider corps.

Glider certificates are offered to successful students in several degrees. The coveted "L" certificate is won by those who have become proficient in night flying (eight night flights), blind flying, and eight flights with a full loading of sandbags, as well as several cross-country flights.

Stuka III's have used Gotha Go-242 gliders to transport ammunition, spare parts and bombs. The Gothas are equipped as repair shops and orderly rooms, so that the Stukas may have everything at hand when they move from base to base.

Technicians of the German air force are drawn from the ranks of the best mechanics in Germany, are given specialized training at government expense and are attached to the air force operational units. Only the most talented Nazi craftsmen are taken into the Luftwaffe.

Training for the Luftwaffe starts early. Many German pilots today first studied aeronautics on glider planes as these boys are doing on the outskirts of Berlin.

And just what kind of a fellow is this Nazi aviator? What does he look like? What pay does he get? How's his morale after his disastrous bouts with the Royal Air Force, the Russian Air Force, and the U. S. Army Air Forces?

His uniform is a gray-blue, with an open blouse similar in cut to those of the U. S. Army Air Forces. With this he wears a black tie and plain trousers of the same gray-blue.

The air force badge, worn by all ranks, is a stylized eagle in flight grasping a swastika. This emblem is worn above the right breast pocket. The pilots and observers badges are similar with the addition of a wreath and are worn below the left breast pocket.

Colors indicating air force branches are worn by all ranks on their shoulder strap and collar patches. In addition they are worn by non-commissioned officers and men as piping on their caps and edging to the jacket collar.

Yellow indicates the flying branch; pink is for engineers; black for air ministry; dark blue for medical; red for flak; brown for signals; light blue for reserve; carmine for general staff; green for air police and white for the elite "General Goering Regiment."

Badges and shoulder straps indicate the difference in rank. Generals wear a white braid stripe down their trousers.

(*Continued on page 158*)

## LUFTWAFFE AWARDS

There is an extensive list of decorations and awards for the German air force. Among the best known are:

### IRON CROSS (CLASS 2)

Awarded after 10 day or two night war flights.

### IRON CROSS (CLASS 1)

Awarded after 20 to 30 day or 12 night war flights.

### KNIGHT'S INSIGNIA OF THE IRON CROSS

Awarded after 40 to 50 enemy aircraft shot down, or equivalent achievement.

### KNIGHT'S INSIGNIA OF THE IRON CROSS WITH OAK LEAVES

Awarded after 60 enemy aircraft shot down, or equivalent achievement.

### KNIGHT'S INSIGNIA OF THE IRON CROSS WITH OAK LEAVES, SWORDS AND DIAMONDS

Awarded after 100 enemy aircraft shot down, or equivalent achievement.

### WAR FLIGHTS BADGE

| | |
|---|---|
| Bronze | 20 war flights |
| Silver | 60 war flights |
| Gold | 110 war flights |

### CUP OF HONOR

Goering's personal award.

## COMPARATIVE PAY SCALES

The German air force personnel is paid much less than men and officers of equal rank in the U. S. Army Air Forces. The following table gives an approximate idea of the comparative scales of pay:

| U. S. AAF | | LUFTWAFFE | |
|---|---|---|---|
| Private | $ 50.00 | Private | $ 22.50 |
| Corporal | 66.00 | Corporal | 52.50 |
| Sergeant | 78.00 | | |
| Master Sergeant | 138.00 | | |
| 2nd Lieutenant (with allowances) | 291.00 | Leutnant (plus allowances) | 90.00 |
| Captain (with allowances) | 432.00 | Hauptmann (plus allowances) | 150.00 |

# ARMY AIR FORCES

***Gen. H. H. Arnold, commanding general of the Army Air Forces, has revealed in detail the story of the gigantic strides made by this country in creating an air force superior in numbers, materiel and achievement to that of any other nation in the world. That such a development took place during our first two years of war when all phases of industrial, commercial and personal life were undergoing a tremendous upheaval is all the more remarkable. In the carefully selected excerpts which comprise this article, FLYING presents for the first time in an aviation publication, a comprehensive condensation of General Arnold's report, including those details hitherto held highly confidential by the AAF for military security reasons.***

IN THE nineteen-thirties, when air power was the unseen guest at those grim conferences which marked the Nazi march to power, the Army Air Corps, which preceded the Army Air Forces, had drawn its blueprints for war.

We operated under these principles:

1. The No. 1 job of an air force is bombardment. We must have long-range bombers which can hit the enemy before he hits us.

2. Our planes must be able to function under all climatic conditions, from the North to the South Pole.

3. We believed in daylight operations.

4. We operated with a precision bombsight.

5. We developed highly-trained crews, accustomed to working as a team.

6. We believed in the strategic precision bombing of key targets deep in the enemy's territory, such as airplane factories, aluminum plants and submarine building bases—as illustrated today by 8th Air Force operations from England over Germany.

7. We practiced tactical operations in co-operation with ground troops. We used fighters, dive-bombers, and light bombers for attacking enemy airfields, communication centers, motor convoys, and troops by means of hedge-hopping aircraft. Such operations have paid dividends in North Africa.

8. We planned combined operations with the Army Ground Forces and Navy, such as have taken place in the Aleutians, in Italy and in the Southwest Pacific.

9. Our research program put special emphasis on high-altitude flight, and we refused to become discouraged when, on October 30, 1935, the first experimental *Flying Fortress*, the XB-17, crashed and burned on its test flight at Wright Field. We ordered 13 more at once.

10. The General Headquarters Air Force was also responsible for our present ideas of organization, maintenance and supply. It was obvious long before 1935, that mere *numbers* of planes were not enough. A powerful air force was the combined result of airmen, air bases, air supply and airplanes.

Before we entered the war we had resources that we could count on:

1. We had the best aircrew material in the world. Our youth were accustomed to teamwork, competition and mechanical processes.

2. Our commercial airlines were flying more miles than all the rest of the world's airlines put together. The airlines had trained men whom we could call on to increase our experience level. We also had in 1939 some 30,000 civilian pilots who could fly or train others.

3. The aviation industry was spending substantial sums on research projects, although it could not match the millions being poured into Nazi-subsidized laboratories.

4. At the time of Pearl Harbor, our principal airplanes were flying successfully. The production of *Flying Fortress* bombers had begun in 1938. The *Liberator* was designed in 1938, and mass production begun early in 1941.

The North American *Mitchell* medium bomber was designed in 1938, and mass production was begun in February, 1941. The Martin *Marauder* medium bomber was designed in 1939, and production started in February, 1941. Design of the Lockheed *Lightning* fighter began in May, 1936; the first flight was in February, 1939, and the first planes came from the production lines in January, 1941. Bell *Airacobra* and Curtis *Warhawk* fighter production began in 1940. Republic *Thunderbolt* fighter production began in November, 1941. The North American *Mustang* fighter was in production for the British at the time of Pearl Harbor.

5. Great as our industrial production was, we were faced with the staggering job of conversion.

6. Since the last World War the Air Corps had followed two policies in relation to the aviation industry.

The Air Corps always endeavored to nourish the aviation industry with experimental and sustaining orders. Although at our air bases for many years we were often grounded for lack of gasoline due to lean appropriations, experimental work went on.

The Air Corps also followed the policy, in contrast to foreign nations, of having two or more companies endeavor to develop the same general type of plane. We believed in competition and individual enterprise. As a result, designers came up with somewhat similar planes of different qualities, such as the *Fortress* and *Liberator*, and the *Mitchell* and *Marauder*, and our many types of fighters.

As of January 1, 1944, it can be revealed that the Army Air Forces number 2,385,000 officers and men, as was planned two years ago. Yet only a few years ago the Commanding General knew literally every man in the Air Corps.

The expansion of our personnel began in 1938 when the Army Air Forces had about 1,300 officers and 18,000 men, with a Reserve of 2,800 officers and 400 men. In 1938 we were building 100 military planes a month. We had 1,600 planes. We then ranked about seventh among the nations of the world in military aircraft, but not in plans and ideas.

In November, 1938, the chief of the Air Corps called aviation manufacturers together. He asked them to plan for unprecedented expansion. He could guarantee them no funds, offer them no contracts. He asked them to prepare to double and triple their plants, to become assembly plants, with sub-assemblies to be produced by the automotive and other industries — whoever could do the job. The aviation industry began making heavy outlays for expansion.

To provide airmen to fly the planes then being built it was necessary to expand Army Air Forces training facilities at once. The idea was criticized as being against precedent, but heads of our civilian flying schools were called in by the Army Air Forces. They were to get ready to teach huge classes in primary flight. The Army Air Forces could offer them no contracts at the time to justify complete change-overs of their programs, but the flying schools immediately prepared to help handle the pilots.

After war broke out in September, 1939, the Army Air Forces took advantage of the bloody lessons being learned in the skies over Europe. Although foreign nations were buying planes in this country, they were reluctant to release any combat data. This kept us from producing combat planes with the latest features. We were not building the world's best or latest combat planes.

An understanding was reached whereby the foreign purchasers could buy from our American factories providing (1) they furnished us with the latest information on combat improvements, and (2) our planes then in production were modified by our aviation industry to be up to date without additional cost to the United States. It was clear that modern combat put a premium on heavier guns, leakproof gas tanks, greater fighter range, protective armor, and tail guns for bombers.

# S REPORT

☆

*Building on an infinitesimal but firm foundation, the U. S. Army Air Forces now leads the world in size and skill.*

☆

The Army Air Forces put its faith in the American .50-caliber machine gun. The gun was based on the .30-caliber Browning.

When Germany attacked Norway in April, 1940, it was another victory for air power. When prevented from moving thousands of troops in ships, the Germans moved them by air. The Germans would have been in a difficult situation had Norway destroyed its airports. The control of airports was shown to be of paramount importance. We learned many things from those operations—ideas and practices that were invaluable to us later. Today, for instance, in the South Pacific, we are forcing the Japs out of one locality after another by seizing airports which are then used by our planes to cut off Jap supply lines, and thus make their bases untenable.

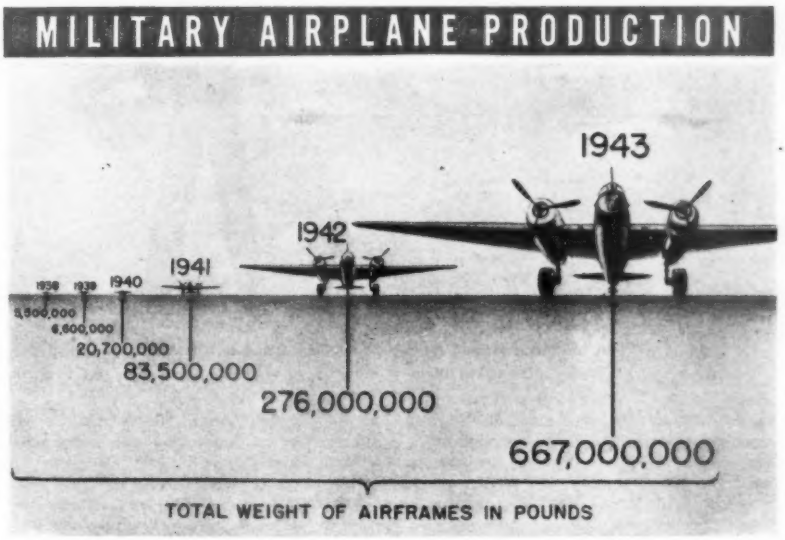
After Dunkirk, Great Britain needed planes to stave off the threatened invasion. The Army Air Forces sent its own desperately needed aircraft to the Royal Air Force. During the fiscal year 1940, the Army Air Forces actually received only 886 airplanes of all types from the manufacturers. However, as Hitler's conquests continued, the Army Air Forces production goal was jumped to 10,000 airplanes. With the fall of France in May-June 1940, the goal was set by our commander in chief at 50,000 planes a year.

By January 15, 1941, the Army Air Forces had grown to 6,180 officers, 7,000 flying cadets, and 88,000 enlisted men. Meanwhile we were short of aircraft of all kinds, due in part to sending planes to our Allies.

In mid-1941 we were building up our aerial lines of communication and supply across the Atlantic and Pacific oceans. In April, 1941, we established weather stations and airfields in Greenland, and we went into Iceland in July of that year.

Germany required 10 years to create her Luftwaffe; we were required to build our air force in one, and to fight with it in four corners of the world at the same time. By December 7, 1941, our expansion program had been well started. The Army Air Forces then had a two-fold task: to build up a gigantic training system, and to hold off the enemy until we could build up strength to take the offensive.

There was no question as to whether the training program could be carried out; the Army Air Forces *had* to become the largest single educational organization in existence in a very short time. Facilities were secured, teachers were hired, and textbooks were written while the first classes were being held. At the start there was little training equipment, such as bombsights, navigators' sextants, or drift meters. Worst of all, actual planes were lacking. Instructors were

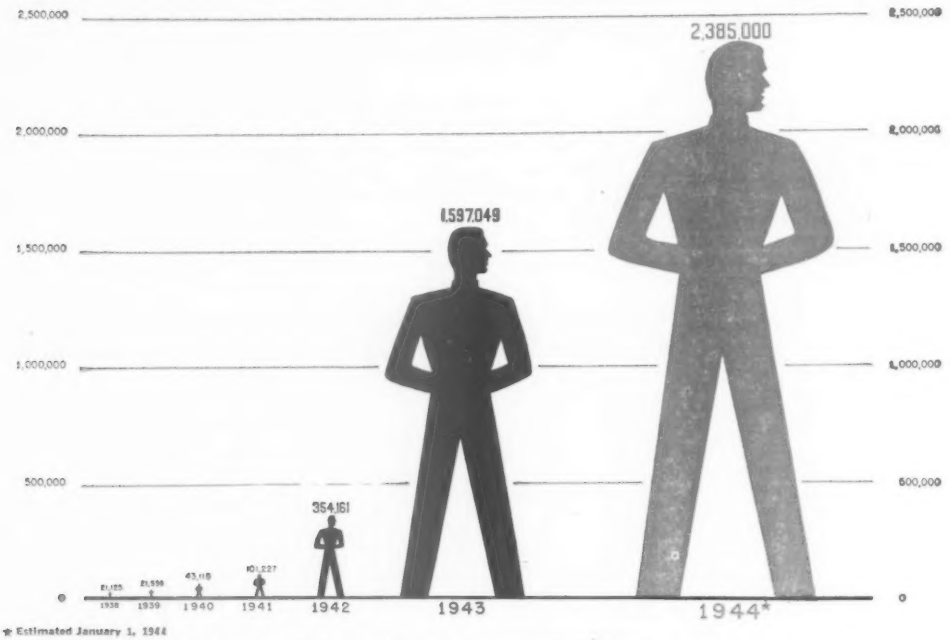



Presented in terms of poundage rather than units as a more accurate measure of production, the above chart dramatizes the manifold increase in AAF aircraft.

BOMBING ENEMY INDUSTRY WHERE IT HURTS
MINIMUM ELAPSED TIME BETWEEN DAMAGE TO VARIOUS LEVELS OF AIRCRAFT INDUSTRY AND ITS EFFECT ON FIGHTING STRENGTH
TIME LAPSE BEFORE BOMBING IS FELT ON FRONT LINE STRENGTH
RAW MATERIALS 10-12 WEEKS
SEMI-FINISHED PARTS 5-10 WEEKS
ENGINE & AIRFRAME ASSEMBLY 3-5 WEEKS
FINAL ASSEMBLY 2 WEEKS
FIGHTING STRENGTH

The continued heavy pounding given German war industries by the AAF's daylight raids is directed toward the disruption of all war production.

# TOTAL MILITARY PERSONNEL IN THE ARMY AIR FORCES




★ Estimated January 1, 1944

General Arnold gave particular emphasis to the personnel statistics of today's Army Air Forces by contrasting them with the days when he knew every member of the Air Corps by name.

somewhat in the position of a man teaching another to swim by showing him a glass of water, but we improvised until teaching materials were ready, working with mock-ups and synthetic aids. Nearly 500 hotels, plus garages, theaters, warehouses, exhibition halls, parking lots, athletic fields and other structures were leased.

Our training system could be compared with assembly line production. Individual training produced skilled specialists, such as the mechanic or bombardier, and the specialists were assembled along the line into fighting teams. Further along, they were assembled into still more complex combat teams; for instance, the reconnaissance units had to become thoroughly familiar with ground force operations; troop carrier units had to practice with the ground units they carried into battle.

As a result of tremendous effort, the Army Air Forces equipped and trained airmen to defeat the enemy who had been preparing feverishly for a decade—and shoot him down in aerial combat at a rate of never less than two planes for one in any theater of war, and at an overall rate of four to one. (Enemy planes destroyed in aerial combat compared with U. S. planes destroyed in aerial combat, Feb. 2, 1942-Oct. 31, 1943.)

Flying safety is vital both to our individual men and to our program; we need every soldier. From the outset, the Army Air Forces have taught the men at home the maneuvers that they would execute in combat abroad.

Despite the tremendous expansion of Army Air Forces flying, the rate of accidents per 1,000 hours flown did not increase as anticipated in the fiscal year ended June 30, 1943, but was, in fact, reduced fractionally from .739 to .716. This rate of accidents was lower than the average rate for the 10 peacetime years of 1931-1940, although more than three times more miles were flown last year than in the whole preceding 20-year period. As a result of the increased proportion of larger and heavier planes carrying more personnel, of faster military aircraft and of newly trained pilots, the rate of fatal accidents was up fractionally from .077 in 1942, to .083 for the full fiscal year of 1943. The trend near the end of the year was downward and in the last quarter the rate was below that of 1942.

Starting with only two officers and one clerk in a small room, today's Air Transport Command totals over 85,000 officers and men.

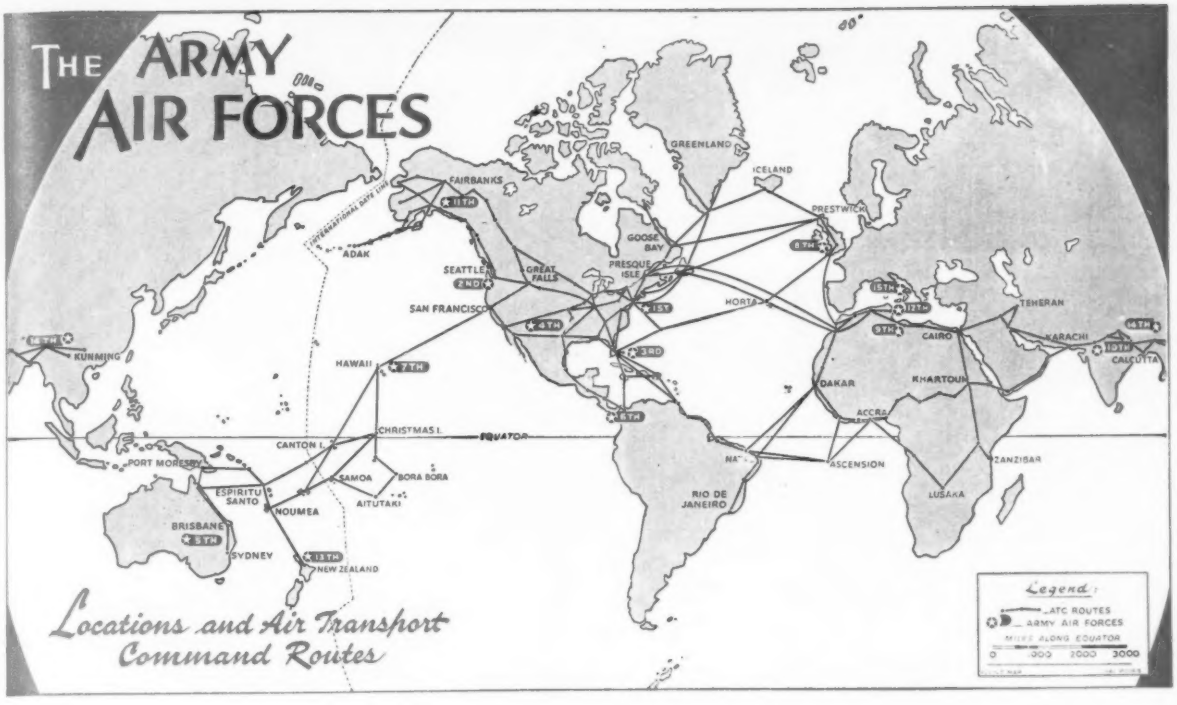
The first ferried plane was delivered to the British on June 7, 1941. By December 7, 1941, approximately 1,200 had been flown to the British and our own Air Forces, and the first delivery had been made across the South Atlantic to Egypt. From that time to this the number of planes in the air and the volume of freight carried have steadily increased. On one recent day 680,000 pounds of materiel, munitions and supplies were delivered by air to one theater of operations.

By July, 1942, it had been determined that military air transportation had grown up; the Ferrying Command was reorganized as the Air Transport Command, to perform all kinds of air ferrying and air transportation. Under its control the various airlines, on contract with the War Department and flying aircraft issued to them by the Army, render transport services for the armed forces and our Allies.

To help meet the tremendous need for personnel, women pilots were first employed by the Ferrying Division of the Air Transport Command in September, 1942. At the same time a training program was begun to train women pilots for ferrying and other duties. Now known as the Women's Airforce Service Pilots or WASPS, they are doing an effective job of delivering aircraft in the United States, from the smallest planes to *Thunderbolt* fighters, *Flying Fortress* bombers and *Skytrain* transports. By January 1, 1944, about 1,000 women, including trainees, were on duty.

Since the Ferrying Command was established in May, 1941, the transport and ferry systems of the Air Transport Command now extend over some 110,000 miles of routes. In recent months an average of more than 12,000,000 miles a month have been flown in ferrying operations and more than 10,000,000 in air transport. It will be realized that air transportation itself does not solve the whole problem of supply, but the ability to fly in vital cargo on short notice can and has turned the tide of battle.

Members of the Women's Army Corps are now serving 20,000 strong at airfields and air bases in the U. S. WACS are filling 200 different jobs in the Army Air Forces, such as Link trainer opera-




Map shows locations of the 15 separate air forces comprising the AAF, and the more than 110,000 miles of routes covered by ATC. From two officers and a clerk in 1941, ATC personnel now exceeds 85,000.

tors, parachute riggers, cryptographers, camouflage technicians, weather observers and flight control tower operators.

The Air Service Command, formed in October, 1941, surpasses in size and is doing a wholesale round-the-globe business greater than any mercantile establishment in the world. It employs 300,000 civilians, of whom 43 per cent are women. The Air Service Command's 300 warehouses contain 500,000 different items—five times as many as are listed in the Sears Roebuck catalog. Every one of them is needed for the 150 aircraft types of the Army Air Forces. The storage space in the U. S. alone is equivalent to a building 75 feet wide and 100 miles long.

The Air Service Command prepares equipment and supplies—which are moved by ship to 210 foreign ports. It can now be stated that for every pilot overseas, the Air Service Command sends out the surprising average of *nine tons of aviation supplies monthly*, not including food and other items handled by the Quartermaster. The Air Service Command supplies 4,000,000 barrels of aviation gasoline per month.

Since our Air Forces fight all over the globe, their officers and men are subject to health hazards unknown at home. When an airplane goes from one theater to another it is carefully inspected so that it does not transport germs or disease-carrying insects.

Calculating the medical and dental supplies needed in all war theaters—for jungle, desert, mountain, and arctic operations—is another task of the Air Surgeon. During the past fiscal year the Air Surgeon's office has co-ordinated the development and purchase of several hundred thousand aeronautic first aid kits, Navy type first aid kits for life rafts, airplane ambulance chests, and frying pan kits which are placed in the seat of the flyer's parachute.

Still another task of the Air Surgeon is directing the air evacuation of wounded men. Since Pearl Harbor, over 125,000 casualties (sick, wounded, and injured) have been flown from combat zones in American transport planes.

The safety of transporting wounded by air has been demonstrated beyond doubt. In the Mediterranean theater from the beginning of the Tunisian campaign in November, 1942, to the close of the Sicilian campaign in September, 1943, more than 25,000 men with all types of illnesses and wounds were transported 8,000,000 miles by air. Only one patient died—one in 25,000.

Trips which would take weeks by hospital train or ship are now flown in a day.

Complete hospital service now moves with the mobility of war itself. Six days after the Army hospital in Nome, Alaska, burned down, a new and complete 25-bed hospital had been flown in from a distance of 3,400 miles. Two field hospitals were flown over the Owen Stanley Mountains in New Guinea. In Sicily, a 50-bed hospital was moved by air 44 miles in two and one-half hours from dismantling until it began receiving patients.

In designing *Thunderbolt* fighters, which maneuver at 400 m.p.h., and *Flying Fortress* bombers which can climb to 40,000 feet altitude, aeronautical engineers have carried aircraft performance far beyond the natural tolerance limits of the human body. To make their planes humanly, as well as technically, practicable, the engineers have formed a close partnership with the medical scientists.

The main oxygen engineering achievement of the past two years has been the production of the demand type oxygen system, replacing the continuous flow type still found in the older planes. The demand system automatically supplies the flyer the amount of oxygen he needs at any altitude up to 40,000 feet.

Constant research is being done on flying fatigue. Rest camps have been established in theaters of operation and in the U. S.

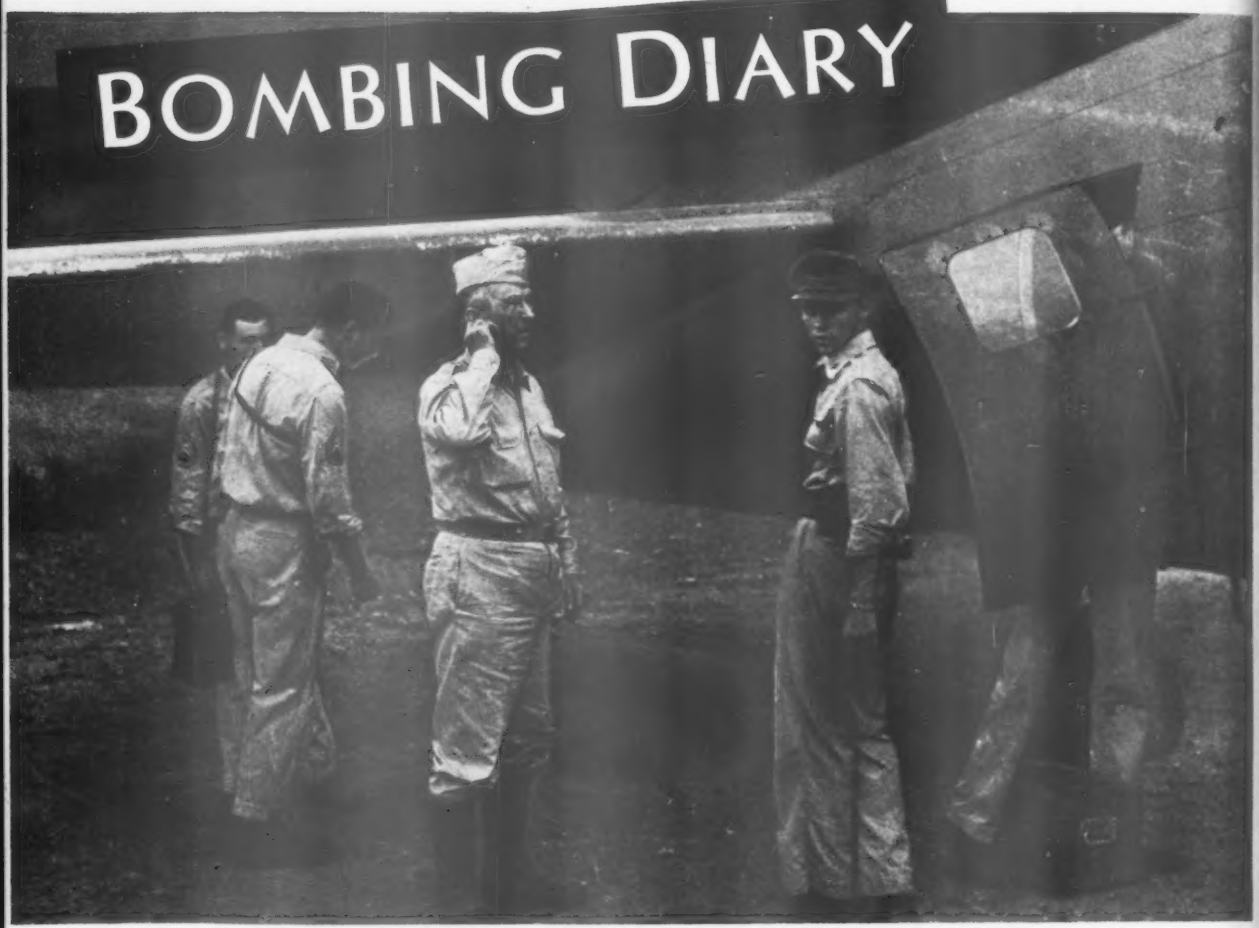
The convalescent training program, which was begun with our men in training, is now being extended to flyers overseas.

Modern war is a war for air bases; the bulldozer must accompany the plane. Aviation engineers operate normally under control of an Air Force, and have been termed an essential part of the air combat team. Airborne aviation engineer battalions, a new type unit initiated by the Air Engineer and unique in our Army, can be flown with their light equipment to locations inaccessible except by air, as has been demonstrated in the Southwest Pacific.

One of the elements of victory in North Africa was the speed with which our

(*Continued on page* 98)

# BOMBING DIARY



Captain O'Brien, facing camera, with Lieut. Gen. Walter Krueger in Southwest Pacific.

By

## J. PAUL O'BRIEN*

*Blank Squadron scourged Jap shipping, improved skip-bombing techniques, was in the Southwest Pacific 11 months.*

Capt. William E. O'Brien.

"THE credit doesn't belong to those of us who came back but to Major Benn, Ken McCullar, Andy and Moore and the others who paid the price to make the Blank Squadron—[Identity censored for security by the War Department—ED.] what it was, 'the hottest outfit in the Southwest Pacific.'"

Capt. William E. O'Brien, of Milwaukee, told the story of his heavy bombardment squadron from the unit's official combat diary. Young—only 22—he looked more like a college boy than a veteran *Fortress* pilot, but the ribbons on his tunic told a different story.

"When the squadron reached Australia in the late summer of 1942, the 19th Bombardment Group, which had been pushed back through the Philippines and Java, had only three serviceable aircraft left; the Japs had everything their own way. When I left last July, the situation was rapidly being reversed.

"During the intervening 11 months the squadron was through the thick of it all—bombing Rabaul, Gasmata, Lae and other Jap bases, hitting their shipping and remaining on alert night and day to halt any attempt by the Japanese to extend the perimeter of their conquests.

"Very early in our operations, the squadron began the use of skip-bombing. Experiments had been made previously by others but it was our squadron that first used skip-bombing extensively and developed it as a technique for heavy bombers in their attacks upon shipping. Lieut. Gen. George Kenney and Major Benn (Maj. William Benn, commanding officer of the squadron) and Major McCullar were pioneers in that field.

"The first experiments were made in September, 1942, by McCullar on the

(*Continued on page* 140)

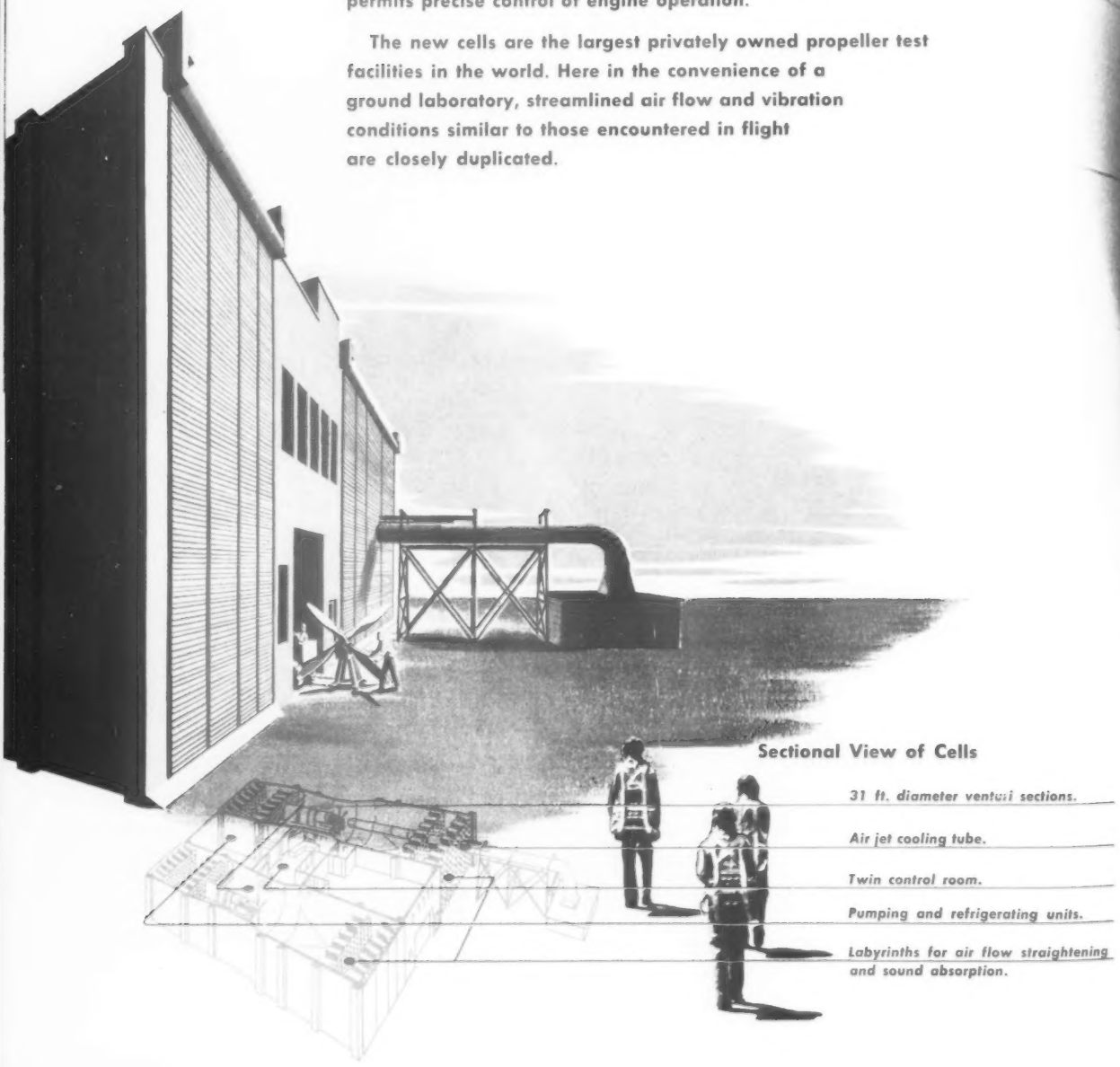
*Captain O'Brien is a cousin of the author, who is a staff writer on the Milwaukee Journal.

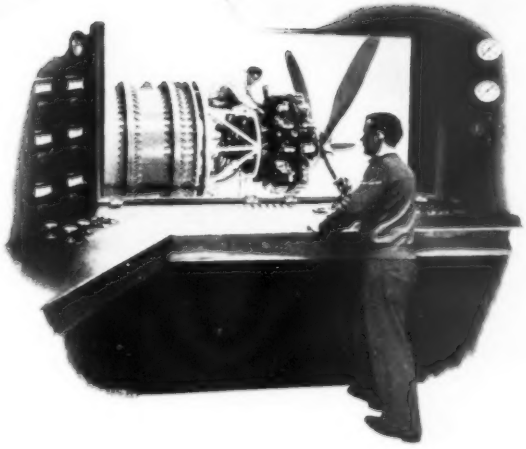
HUNCHED OVER HIS BOMBSIGHT, A FORTRESS BOMBARDIER AIMS AT A TARGET.

# proving ground for the big blades

Stepping far ahead of current engine and aircraft design, the new Curtiss twin test cells have been built for the express purpose of developing the huge blades of the future. Propellers up to 30 ft. in diameter may be tested on either liquid or air-cooled engines with ratings up to 5000 HP. A scientifically designed venturi section eliminates turbulence of air. A combination of cooling systems permits precise control of engine operation.

The new cells are the largest privately owned propeller test facilities in the world. Here in the convenience of a ground laboratory, streamlined air flow and vibration conditions similar to those encountered in flight are closely duplicated.


Sectional View of Cells
31 ft. diameter venturi sections.
Air jet cooling tube.
Twin control room.
Pumping and refrigerating units.
Labyrinths for air flow straightening and sound absorption.

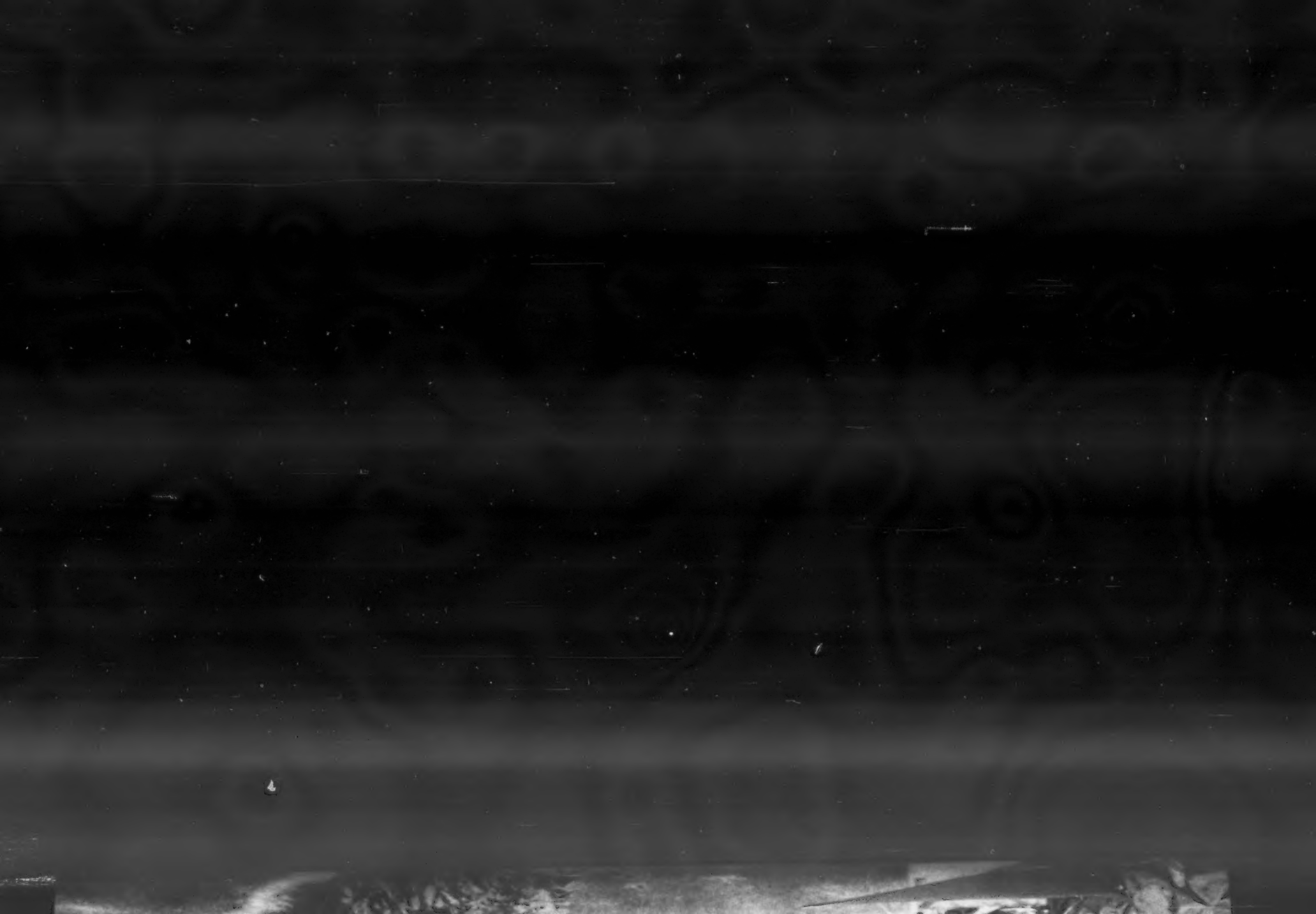


*In operation,* the 48-inch air jet cooling tube slides forward until it covers the spinner and is within a few inches of the propeller blades. A central cone inside the tube spreads the air into annular ring form to deliver it around the hub and directly into the cowl opening. The operator in the sound-proof control room has a clear view of the propeller and engine during the test from several observation windows.

# CURTISS ELECTRIC PROPELLERS

*Curtiss-Wright Corporation, Propeller Division*

PORTABLE, MAKESHIFT OVERHAUL FACILITIES IN AFRICA PUT AN RAF HUDSON BACK IN SHAPE.



# PRODUCTION BY REPAIR

Damaged Spitfire, aboard 60-foot long transport known as "Queen Mary," is headed for repair base near Tunisian front.

By J. I. WADDINGTON

Fellow of the Royal Aeronautical Society

*Great Britain has developed its aircraft repair organization into a close rival of production.*

IT has been said that this present war is one of production—that the group of nations which can produce and use the greatest quantity of weapons must be the victors. This is undoubtedly true, but the real significance of the word "production" has been misconstrued by many people as meaning solely the manufacture of *new* articles and appliances. The word has, however, a far wider connotation. Certainly it includes the replacement of lost and damaged weapons by repair.

Today British production by repair amounts to approximately 60 per cent of new aircraft production. For every 100 new aircraft delivered by Britain's factories an additional 60 are "produced" by repair organizations.

During the early part of the war the cry was for new aircraft and more new aircraft. The factories extended themselves to meet the cry while spare parts production suffered until it was realized that there was an essential balance between the two demands and that the effort expended on spare parts production repaid in its own proportion equally with the delivery of new aircraft.

Repair organizations in Britain alone have 100,000 employees, a measure of the importance of their work. The savings created by repair can be conveniently divided into five major headings:

(1) Shipping space
(2) Raw material
(3) Labor
(4) Productive capacity
(5) Cost.

Shipping space requirements demand that every possible cubic foot be saved. Every new aircraft requires the import by sea of material or finished parts and, in order to keep these down to a minimum, every part possible must be repaired rather than scrapped and replaced by a new component.

However great may be the natural richness of a nation in raw materials, manpower is needed in their production—and even in their reclamation from material in scrapped fabricated components—and here again greater economy can be obtained by repairing fabricated components on the spot rather than by manufacturing them from natural materials.

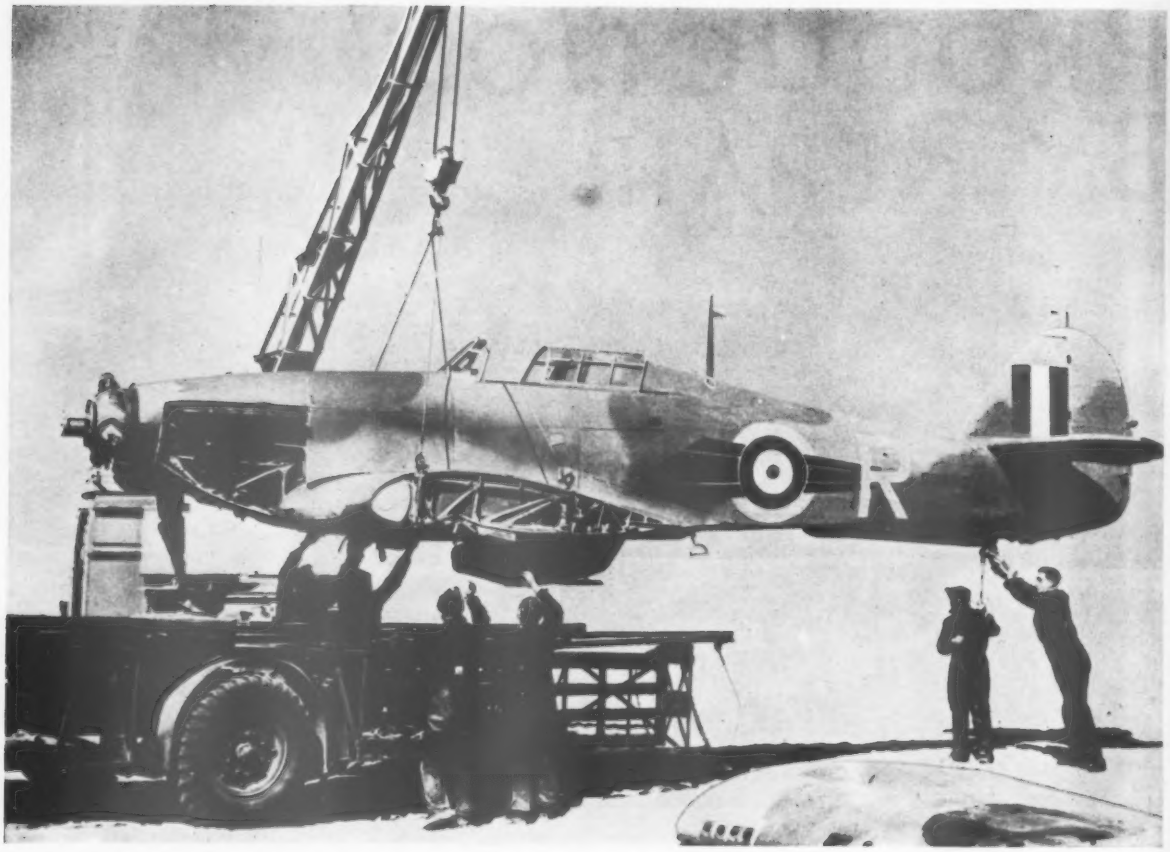
Already an insufficiency of skilled labor is apparent in the United States, and Britain had to face this condition shortly after the outbreak of war. By using a limited amount of skilled labor it is possible to swell considerably the production of new aircraft by production from repair.

These remarks apply also to productive capacity. An aircraft on the production line occupies plant space for hundreds of hours before it becomes a flying machine and if a damaged aircraft can be made into a flying machine again without using this precious space the advantage is apparent. Hence many aircraft are repaired in the open at the scene of the accident.

An analysis of the cost of repair is interesting. Average figures show that the total repair costs, as a percentage of new production costs, are respectively:

A typical fighter 17 per cent, a typical bomber 30 per cent, instruments in general 52 per cent, a well-known engine 31 per cent, propellers 24 per cent. Armament averages are: (1) .303 Browning four per cent, (2) universal bomb carriers 10 per cent, (3) light series bomb carriers eight per cent, (4) small bomb container 13 per cent.

The repair organization in Great Britain did not come into being suddenly. Its early life was full of problems and it



Mobile crane lifts damaged Hurricane aboard truck for shipment to repair base. Note detached wings in foreground.

still has to fight its way through many conflicting interests. The collapse of France and the Battle of Britain—the two highlights of the war up to the invasion of Russia—proved the value of production by repair.

Before the war, Britain's Air Ministry decided that a repair organization capable of rapid expansion in time of war was desirable. It was anticipated that the aircraft industry would be so fully occupied with new production that a separate organization would be essential to carry out repairs.

The lull that followed the declaration of war saw the creation of a Director General of Maintenance at the Air Ministry, and a Civilian Repair Organization (CRO) which was made responsible for finding repair capacity. Civil airlines and their mechanics were among those brought in but lest new production be retarded the CRO was forbidden to place repair contracts with aircraft manufacturers.

The fall of France meant not only the loss of repair and salvage units in France, but also loss of their vast stock of equipment. Serious dislocation of production and repair resulted and more equipment had to be produced to replace that lost. Aircraft were wanted at once to repel imminent invasion. Production and repair production were pressed to the maximum. Repair production demanded replacement parts but the manufacture of these retarded production.

So the fight began, with production holding the better hand. Aircraft were turned out at the expense of the spare parts necessary to maintain them.

A new department—the Ministry of Aircraft Production—was called into being. Its one function was to produce more and more aircraft and the development, production and repair branches formed an important part of the new ministry. The CRO was placed directly under the Directorate of Repair and Maintenance (DRM) empowered to contact aircraft manufacturers. This departure did not have the ill effects which many believed would result by superimposing repair work on production.

With the collapse of France, the repair production capacity of the service repair depots at home became even more important and their staffs were greatly enlarged to cope with the anticipated additional work. These service repair de-

(*Continued on page* 90)

Salvage boats augmented land crews in recovering this Armstrong Whitworth Whitley. The output of repair units is 60 to every 100 new planes produced.

*Compiled and edited by the Washington staff of FLYING.*

## Jet Propulsion

A description of the Whittle jet propulsion engine which provides power for the Army Air Forces jet propulsion plane so sensationally announced recently, is here published in FLYING for the first time. The plane has been one of the great hush-hush secrets of the war. Yet the Germans all along had access to the invention through British and Swiss patents taken out by the inventor in 1935 and 1936. In fact, the material herein revealed was first published in *Flugsport*, official magazine of the German Air Force, in January and February, 1939, and translated into English by the British magazine *Aircraft Engineering*. Whittle's British patent is 347,206; his Swiss patent numbers are 188 758 and 195,823.

Development of the engine to practical operation was made in conjunction with General Electric engineers, undoubtedly because of the wide experience of that company in meeting the problems of extreme heat on metal working parts which had been gained in successful development of the turbosupercharger.

Frank Whittle, the RAF inventor-scientist from Cambridge University, England, first patented his system of a jet propulsion engine as long ago as 1930. Whittle's patent later was improved upon and new patents were obtained in Switzerland in 1935 and 1936. As described in these patents it operates through the compression and superheating of air which has been compressed, enriched with fuel and ignited. The great expansion of the gases so treated provides the propulsion necessary for the plane when they are ejected at great speed through nozzles.

The air enters on both sides of the rotor of a centrifugal compressor. Entering near the axis of the rotor, the air accelerates to super-sonic speed as the vanes of the rotor throw it to the circumference of the rotating wheel. The air is thus forced into a helical guide or volute, which is a spiral form that collects the air. The air then is guided into a spiral combustion chamber of increasing cross-section. At this point, about 22 per cent of the air is mixed with fuel in an ignition pipe where it is ignited. Leaving the pipe through a nozzle, the enormously expanding gases drive a turbine which operates the first compressor and then proceed by way of the exit channel to produce the recoil out of the rear nozzle which gives the plane its propulsion.

This is a simplified version of what is, in essence, an extreme simplification of the means of getting power from fuel. Instead, as in the conventional engine, of the expanding gases being used to drive a piston inside a cylinder which in turn drives a crankshaft which drives a propeller which obtains the propulsion, the expanding gas is used to obtain the propulsion directly. The jet propulsion engine theoretically operates with greatest efficiency at supersonic speeds, at which point conventional propellers fail to function properly.

Whittle has developed a twin propulsion system using his basic principles.

## Jet Jamboree

Almost as strange and Jules Vernish as the RAF-AAF Bell Aircraft Corp. jet propulsion plane itself was the way it was announced in Washington and the reactions that followed.

The release of the announcement was dramatic in its understatement. The scene was the AAF press room, Pentagon Building. The time was 5:20 p.m., Thursday, January 6. Reporters were swinging on the phones, calling in stories on an interview with Maj. John S. Garrenton, a flying staff chaplain fresh back from India. Enter, down right, a major with an armful of handouts. Since this happens every hour on the hour around PRO, everybody kept on talking on the phone and didn't so much as glance at the copy when it was laid on the desk.

One conversation neared completion, then another. Eyes wandered to the jet propulsion story. The reporters began to read absently, then began to shout.

Thus broke one of the great stories of this or any year.

The following morning, every aviation authority in Washington spent most of his time being asked questions to which he didn't have the answers. There was a long line at the Pentagon, where British and U. S. public relations men parried queries as best they could. Most of the real news came from England and over the radio. Perhaps the former was only fair, since the British had the key man of the story—Group Capt. Frank Whittle, the 36-year-old inventor. But it didn't help the situation here, where you were told, for example, that the biggest secret about the new engine was the fuel it burned, only to turn on your radio the next minute and learn from the British Information Report that the fuel was kerosene.

This should be added: the highest praise is not enough for the scores of U. S. engineers—Army and civilian alike—who worked on the engine and the plane for more than a year without let-

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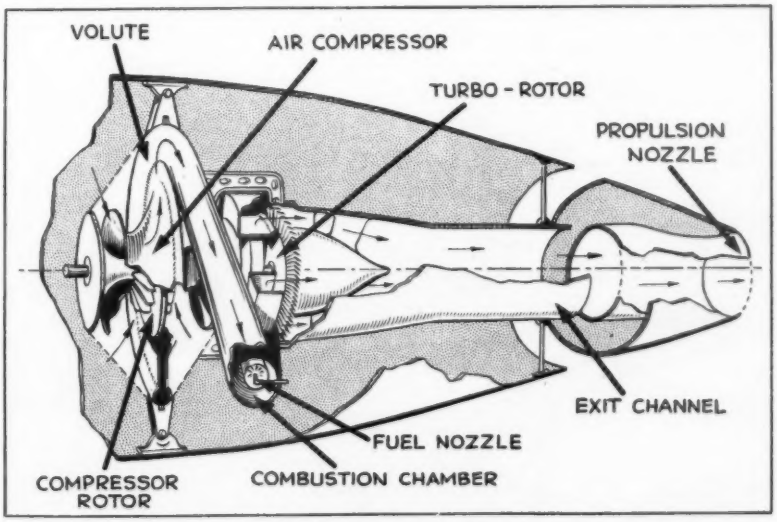
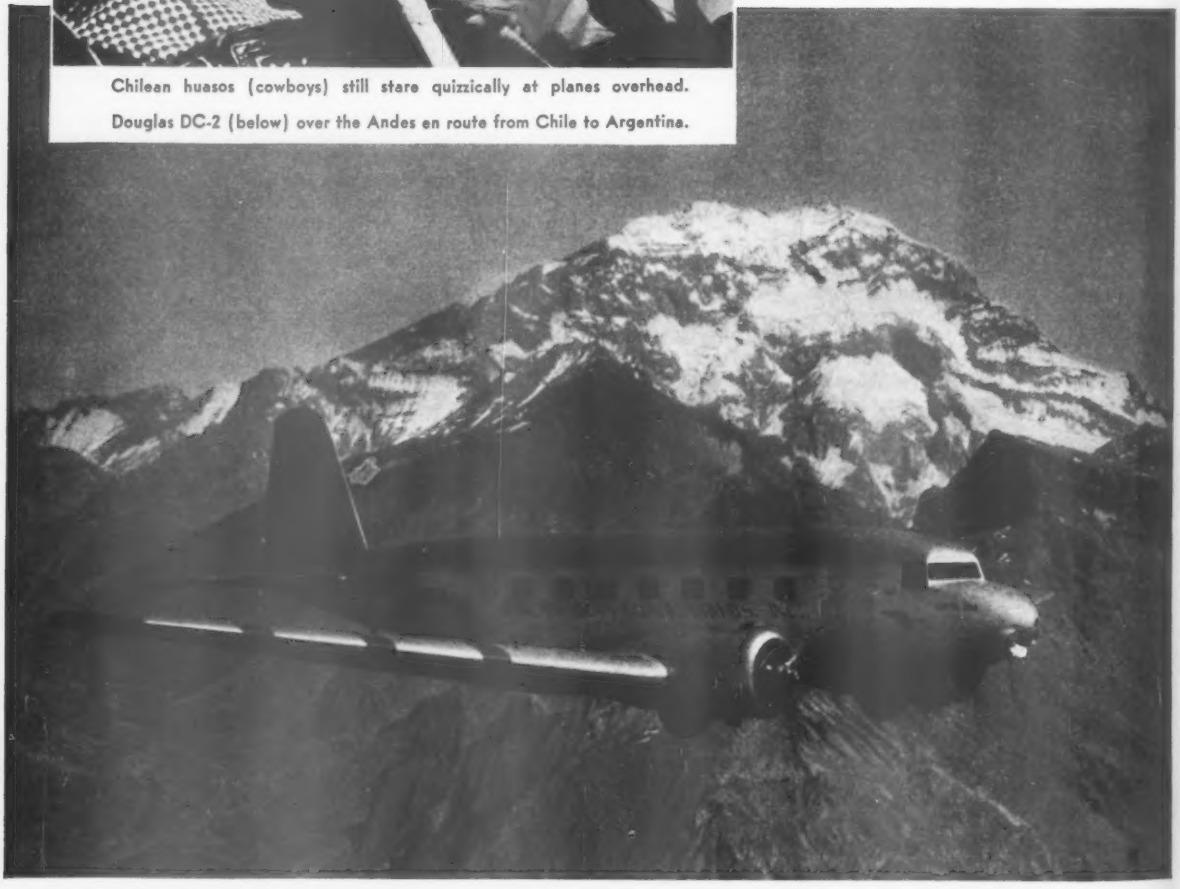



**FLYING drawing based on Whittle's Swiss patents. The air is compressed, mixed with fuel and ignited. Part of the energy drives compressor, the rest propels the plane.**

Chilean huasos (cowboys) still stare quizzically at planes overhead.

Douglas DC-2 (below) over the Andes en route from Chile to Argentina.



# CHILE'S

IT WAS early in the morning of December 12, 1918, and young Lieut. Dagoberto Godoy stood beside his single-seat, 110-h.p. monoplane peering eastward toward the dawn—and a grim row of 20,000-foot mountains only 60 miles away. From El Bosque, military airport at Santiago, Chile, he could see mist-like clouds hovering over the jagged Andean peaks. It was cool in the dawn, but Lieutenant Godoy would be a lot cooler before he finished his epic flight, for his frail craft had an open cockpit.

At 4:20 a.m. he stepped into the plane. The roar of his liquid-cooled engine was comforting as he taxied down the field. The rest of his flight is history. Little more than two hours later—at 6:35 a.m.—he set down at Lagunillas near Mendoza, Argentina. The first flight had been made over the Andes!

Modern aviation progress in Chile dates

# AIR TRANSPORT

By JOHN C. ROSS

*Now celebrating the 25th anniversary of the first flight over the Andes, Chile has shown a constant increase in air activity, despite natural barriers.*

from that pioneering feat. The entire country, on the 25th anniversary of the flight, has just paid homage to the flyer who performed it. The anniversary date was officially designated "Aviation Day," and with 25 years of air progress behind it, Chileans look enthusiastically to the future of aviation in their progressive South American nation.

Today air travel plays a unique part in helping to solve Chile's transportation problems. Here is a country more than 2,600 miles long from north to south, yet less than 250 miles from east to west at its widest point. Surface transportation is fairly well-advanced despite the terrific geographical barriers. These barriers include deserts, high hills and mountains, glaciers, deep fiords, and a sub-polar climate in the south. Despite this, Chile has about 5,490 miles of railroads and 22,613 miles of highways.

Chile also has 2,643 miles of airlines. A long ribbon of a country, crowded between the high Andes and the Pacific Ocean, and stretching from Peru south almost to Cape Horn, Chilean commerce must cover immense distances for a country only slightly larger in area than Texas. From Africa on the north to Punta Arenas on the south is farther than from New York to Salt Lake City, Utah. All routes are north-south routes, however. The only east-west routes passing over Chile are Panagra routes Argentina-bound.

Chile is served by two airlines, the National Air Line (Linea Aerea Nacional), known in Chile as LAN, and Pan American-Grace Airways, which supplies the international and transcontinental service. Civil aviation is under the Department of Aeronautics (Direccion de Aeronautica) which is under the control of the Ministry of the Interior.

LAN is the only airline permitted to

"El Cristo," peace monument on Chile-Argentina boundary in La Cumbre pass. Argentine meteorological station is at left, the Chilean air force radio station is between towers. In foreground is Panagra's radio station. Altitude exceeds 12,000 feet.

carry traffic from point of origin to destination within Chile. LAN began operations in 1930, along the coast line from Santiago north, and later south to Concepcion. At present, Concepcion is the southernmost city in Chile to receive regular LAN service—an indication of how far aviation has yet to invade this long nation whose southernmost city, Punta Arenas, is more than 1,000 miles south of Concepcion and was the southernmost city in the world. Of course a great deal of southern Chile is quite unproductive and complete aviation service may still be a long way in the future. The present line is projected to Castro on the island of Chiloe, Puerto Montt and points south, however.

LAN'S northern route, 1,075 miles from Santiago to Arica, gives both local and express service and touches the cities of Ovalle, La Serena, Vallenar, Copiapo, Taltal, Antofogasta, Tocopilla, Iquique, and Arica. Santiago, the capital city, is the main terminal of travel from north, south and east. It is the southernmost point touched by Panagra, and a stopping place for two parallel LAN lines from the north and one line from the south. The principal customs airport of Chile is Los Cerillos, which is equipped with night flying facilities. Near Santiago, at El Bosque where Lieutenant Godoy took off on his trail-blazing flight, are the aviation school, antiaircraft defense group, central repair shops, aviation arsenals and mechanics' school.

Panagra enters Chile at Arica, first port of call and northernmost Chilean port, some five and one-half hours by air from Santiago. It continues south to the important nitrate port of Antofogasta. From this city one branch goes eastward through Salta, Argentina, to connect with the eastern division of Pan American Airways in Buenos Aires. Another branch extends southward to Santiago, and thence crosses the Andes to Mendoza, Argentina, and on to Cordoba and Buenos Aires. The complete Panagra air line from the Panama Canal Zone south to Argentina has an unduplicated route mileage of 7,436—longer than that of any commercial air line operating within the United States.

The Antofogasta-Salta route was pioneered in 1942, to provide direct service and relieve the heavy traffic on the more southerly route over the Andes between Santiago and Buenos Aires. Experimental flights at that time indicated that atmospheric conditions were excellent and the route was established September 6, 1942. Flying time of the route to Salta is approximately 2 hrs. 20 min., each way.

Panagra and LAN provide excellent service to elongated Chilean area.

Chile has five services per week to and from the United States and there is daily service to and from Argentina. Flying time now is less than four days for the 5,000-mile trip from New York City to Santiago. A sea journey would require three weeks—another reason why commercial aviation has made such rapid strides in Chile—South America's "ribbon country."

A glance at government-compiled statistics will indicate how aviation has grown in Chile within the past few years. During the first 11 months of 1940, a total of 3,631 persons entered Chile by air. For the corresponding period of 1941, the figures are 5,036 and for 1942, the total reached 5,779. Departures over the same periods were 3,520 in 1940; 4,992 in 1941, and 5,843 in 1942. Thus, in two years, air arrivals and departures increased nearly 62 per cent.

During the like periods, Chile's domestic lines also showed a substantial increase. Eleven-month statistics showed the following: In 1940, a total of 2,213 passengers, 32,044 pounds of freight, and 15,447 pounds of mail; in 1941, a total of 6,753 passengers, 61,407 pounds of freight, and 18,936 pounds of mail; in 1942, a total of 13,436 passengers, 72,759 pounds of freight, and 23,985 pounds of mail. Thus 1942, compared with 1940, showed an increase of 507 per cent in passenger traffic, 124 per cent in freight traffic, and 55 per cent in mail traffic.

Airline operation in Chile must cope with some of the most difficult problems found anywhere. In the north, where Panagra enters the country, is to be found what is probably the dryest desert in the world, where the heat and dust impose serious operational problems. Rich nitrate mines are in this area, however. The desert gives way gradually to temperate regions. The bulk of the country's population is concentrated in the fertile central valley—one of the garden spots of the world.

Still farther south, the valley gives way to a densely forested region with excessive rainfall. The forested country grows colder and colder until finally it becomes sub-antarctic. Sheep ranges exist in this southern region of Tierra Del Fuego. Planes operating north and south along the narrow coastline thus meet a wide variety of weather and climatic conditions. Similarly, east-west travel entails an Andean crossing with all the hazards of some of the highest mountains of the world.

Chile is a country of hills, mountains and valleys. There are comparatively few level areas where a plane might land in an emergency. It is not a country of easily leveled runways or great flat prairies where lightplanes might

(*Continued on page* 170)

Panagra Douglas DC-2 at Los Cerrillus airport, Santiago. All phases of Chilean air commerce show continuous growth.

# FUTURE Air Traffic Control

*Sufficient airways and airport facilities can be provided the anticipated air traffic of 1950 if control facilities keep pace, the CAA's analysis indicates.*

The movement of all planes flying within a certain area are represented on the progress board (at left) in La Guardia Field's air traffic control office.

(Concluded from February issue.)

THE ratio of handled movements to the number of privately-owned aircraft, as shown in records for 1940 non-scheduled flying, is approximately 60 movements per plane per annum. The records of miles flown per plane show that as aircraft are improved and their operation becomes easier, safer and cheaper, there is a tendency to use them more. Military planes are flown more often than civilian planes and their inclusion in the total will tend to further increase the average number of annual movements per plane. It may be expected that in 1950, non-scheduled flying will average from 90 to 100 movements per plane per annum which, in turn, means that from 45,000,000 to 50,000,000 aircraft movements will then be produced annually from this source.

Adding now the estimated aircraft movements for scheduled and non-scheduled flying, we obtain a low estimate of 53,000,000 and a high estimate of 60,000,000 aircraft movements per annum in 1950. In view of the foregoing, and bearing in mind that most of the predictions made in the past by experts have fallen short of actual air traffic expansion, we must choose 60,000,000 aircraft movements per annum as the probable rate of traffic to be handled by the air traffic control service during the year 1950.

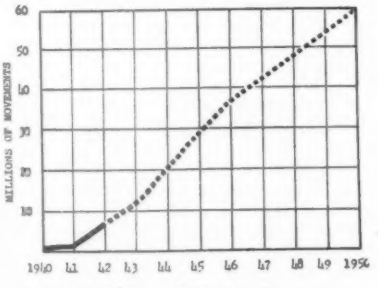



Fig. 2, showing estimated traffic curve.

Figure 2 presents a traffic curve illustrating aircraft movements for the years 1940, 1941, and 1942 (solid line), the estimate for 1943 mentioned before (broken line), and the estimates for succeeding years, 1944 to 1950 (dotted line). The flattening of the curve for the period from 1946 to 1950, gives consideration to a probable sharp drop at the end of the war, during which time the majority of the aviation industry will be changing from the production of military to private aircraft. In this respect, however, it is interesting to remark that the curve of automobile registrations did not show any sagging tendency after World War I, but on the contrary, continued to rise as steeply as before. Therefore, it is not improbable that, should the war end by 1945 or 1946, the resultant impetus to civil aviation would cause the estimates for later years to be exceeded. This would be due to the release of great numbers of pilots from military service, the release of some military transports for civilian use and also the return of many military aviation units from foreign service.

During past years (and including the present time), large numbers of non-scheduled aircraft were flown "contact flight rules" whenever possible and their movements, although *handled* by the air traffic control service, were not *posted* on the flight progress boards or approved by the airway traffic control centers. It is therefore necessary to get an idea of the number of aircraft movements which were actually posted as against those which were merely handled, for the reason that it is the former which will determine the type and size of the facilities required to properly control such traffic. For the purpose of this study, these aircraft movements requiring ATC approval and posting on the flight progress boards of a center can be called "instrument flight plan movements."

Contact flight rule operations are "potential" instrument flight plan movements, since in case of lowering weather conditions these flights may change to instrument flight plans. These contact flight rule flights are, however, normally handled by other than control personnel unless lowering weather conditions indicate a possibility of these flights becoming a hazard to instrument flight plan operations.

All flights by air carriers, whether in

contact or instrument flight rule weather conditions, are conducted under instrument flight rule procedures and are posted on flight progress boards and receive approval from airway traffic control centers.

In the year 1942, about 20 per cent of the total traffic was the result of air carrier activities. In 1943, air carrier activities will represent only about 10 per cent of the total traffic, or from 1,100,000 to 1,200,000 movements—the decrease in percentage reflecting the effect of war time assignment of many air carrier aircraft to the military services. As shown previously, it is estimated that the air carrier traffic will be represented by eight to 10 million movements per annum in 1950, all of which will be instrument flight plan movements.

During the latter half of 1942, defense regulations prohibited flight under any but instrument flight plans in vital defense areas near the coasts and placed some restrictions on all flights. Other defense and conservation regulations also restricted private flying. These regulations, in addition to intensified instrument flight training of pilots, have steadily increased the percentage of non-scheduled instrument flight plans requiring approval and instructions from airway traffic control centers.

During 1942, the proportion of non-scheduled flying on instrument flight plans increased from six per cent to nine per cent and during 1943, had increased to 12 per cent.

The number of instrument flight plan movements for non-scheduled traffic amounted to 407,000 in 1942. It should total from 1,200,000 to 1,300,000 movements for 1943.

In the future it is expected that the proportion of military pilots and private owners flying on instrument flight plans will continue to grow, particularly as soon as defense and conservation restrictions are lifted, and it is quite likely that it may greatly exceed 12 per cent—private flying consisting mainly of local flights at the present time. It is certain that, after the war, private aircraft will be more generally used for point-to-point flying, which cannot be safely undertaken without instrument flying equipment and knowledge. A large number of those who will fly their own planes will be Army-trained pilots and will have that knowledge. Furthermore, the development of new devices for war purposes will inevitably lead to a great simplification of instrument flying at a substantially decreased cost.

Under the circumstances, it would not be safe to plan on less than a minimum of 10,000,000 instrument flight plan movements for non-scheduled flying in 1950, (20 per cent of the anticipated non-scheduled movements).

Adding the instrument flight plan movements for scheduled and non-scheduled flying, we obtain estimates of 2,300,000 to 2,500,000 for 1943, and 18,000,000 to 20,000,000 in 1950.

To be on the safe side, we must choose 2,500,000 in 1943, and 20,000,000 in 1950, as the probable rate of traffic operating on instrument flight plans and on which

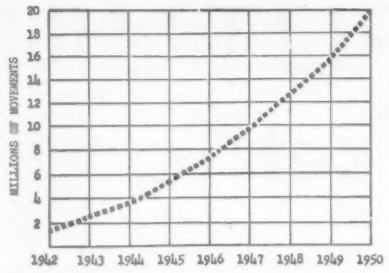



Fig. 3, instrument flight plan movements.

data are to be posted and control procedures exercised by the Air Traffic Control Service during the period.

Figure 3 presents a traffic curve illustrating instrument flight plan movements for the years 1942 to 1950. The general shape of this curve differs from that of Figure 2 because it takes into account an anticipated continually increasing ratio between instrument flight plan movements and total movements of aircraft in non-scheduled operation.

A study has been made to determine the rate of instrument flight plan movements per peak hour in the busiest airway traffic control areas. The busiest centers were selected for the study, since it is in these places that the strain on personnel and facilities is greatest and in these centers that personnel, procedures and facilities have been developed to their highest efficiency. The other centers, as traffic increases, will progressively encounter the same problems. The two centers selected for intensified study are the New York and Washington Airway Traffic Control Centers.

The instrument flight plan movements per hour in the busiest peak hours of the New York and Washington areas are

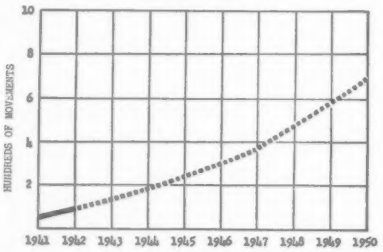



Fig. 4, New York area traffic, 1941-50.

plotted for the fiscal years 1941 and 1942, and estimated for the years 1943 to 1950, in Figures 4 and 5. The estimates are based on the actual rise from 1941 to

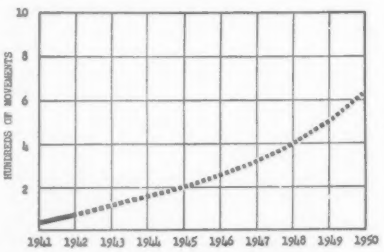



Fig. 5, Washington area traffic, 1941-50.

1942, and the estimated traffic trend shown in Figure 3. The graph in Figure 4 shows a progressively increasing traffic rate of from 40 aircraft movements per peak hour in 1941, to more than 700 movements per peak hour in 1950, for the New York area.

The graph in Figure 5 shows a progressively increasing traffic rate of from 35 controlled aircraft movements per peak hour in 1941, to more than 600 movements per hour in 1950, for the

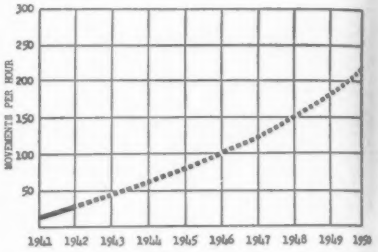



Fig. 6, analysis of New York area sector.

Washington area.

The peak hours plotted in the graphs are the highest peak periods of each year. The average peaks of a year run

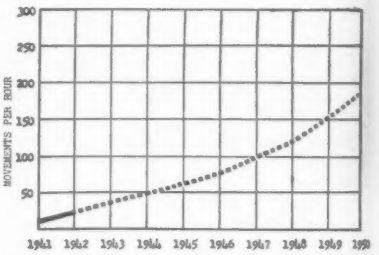



Fig. 7, analysis of Washington area sector.

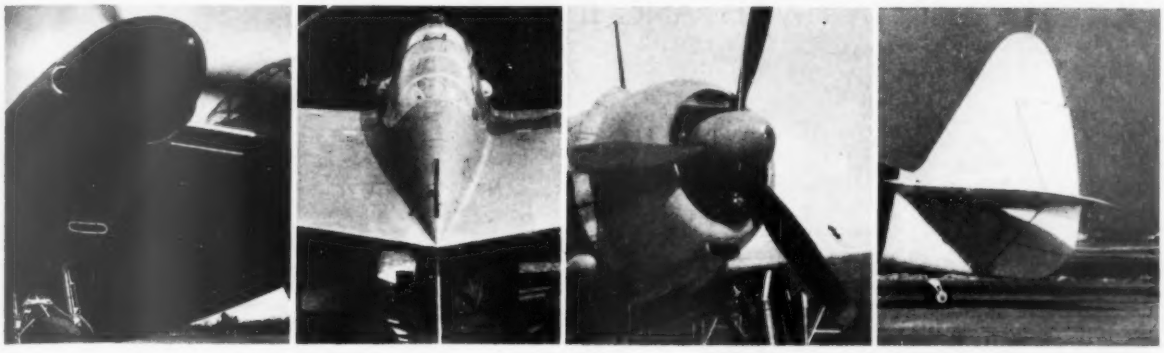
between 60 and 75 per cent of the highs. Planning, however, must be on the basis of the highest peaks.

Each airway traffic control area is divided into sectors for efficiency in controlling the traffic pattern, and the traffic in each sector forms an integral part of the whole traffic pattern of the control area. Therefore, it was decided that this study of traffic trends should be directed toward the busiest sector of each of the control areas under consideration in order to present a true picture of peak traffic conditions. On highways leading to a large city, a greater percentage of traffic travels over one or two main routes than any of the others. The same principle applies to traffic over the airways in a control area. It was found that from 30 to 34 per cent of the total traffic of the control area operates over the busiest route.

In each of the two control areas selected for this study, the busiest route was picked for further investigation of actual traffic conditions. A minimum-size sector (one reduced to the smallest size consistent with efficient control) along the busiest route in each control area was used as a bisis for the graphs shown in Figures 6 and 7. In the New York Control Area, a sector on the Phila-

(*Continued on page* 122)

# FOR IDENTIFICATION



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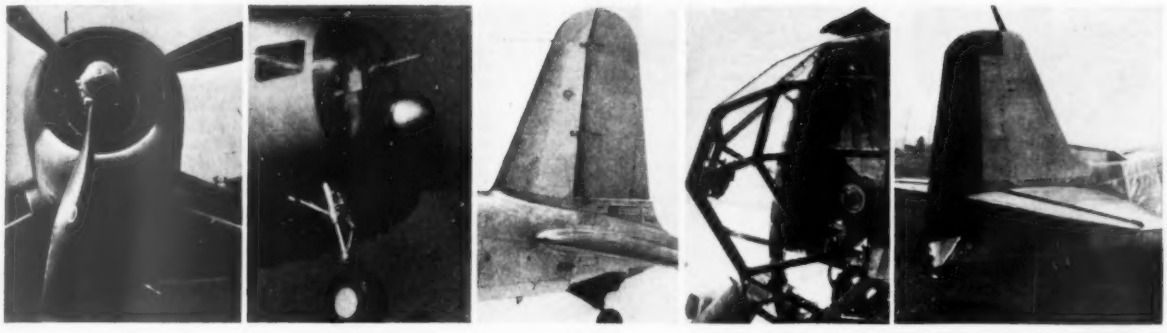


5 6 7 8 9

The planes are: 1. DeHavilland Mosquito; 2. Lockheed Lightning; 3. Curtiss Helldiver; 4. Howard Nighthawk; 5. Vought Corsair; 6. Fairchild Gunner; 7. Vultee Valiant; 8. Junkers Ju-88; 9. Grumman Hellcat.

## MISTAKEN IDENTITIES

GRUMMAN'S *Hellcat* and *Wildcat*, frequently confused, are shown here to exact scale. Despite marked differences, the newer *Hellcat* closely resembles the smaller *Wildcat*. Comparison should be made between landing gear, wings and tails.

Copyright, FLYING, March, 1944

Hellcat (F6F)

Wildcat (F4F)

Hellcat. Span: 42 ft. 10 in.

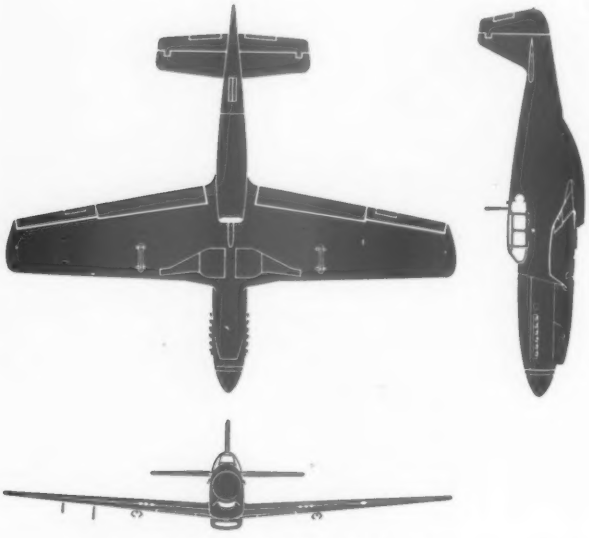
Wildcat. Span: 38 ft.

Hellcat. Length: 33 ft. 6¼ in.

Wildcat. Length: 28 ft. 11 in.

# NORTH AMERICAN MUSTANG II

Fighter



PERTINENT FACTS: Just going into combat as this is written, this airplane probably will become the outstanding single-engined fighter in the world. A modification of the original Allison-powered, low-altitude *Mustang I*, the *Mustang II* is powered with the Packard-built Rolls-Royce *Merlin 61*, which develops over 1,500 h.p. Unlike the *Mustang I*, the newer *Mustang* (technically the P-51B) is a high-altitude fighter; service ceiling is over 30,000 feet. Top speed is more than 400 m.p.h., normal range is less than 1,000 miles. Wing span is 37 feet, length, 32 ft. 3 in.; height, 13 ft. 8 in. Gross weight is about 10,000 lbs. Bomb load is 1,000 lbs. Armament is four or six .50 cal. guns, depending on requirements.

WHAT TO LOOK FOR: The low, cantilever (laminar flow) wing has slight leading edge taper and pronounced trailing edge taper, with square tips. Main external difference between the appearance of the *Mustang I* and *Mustang II* is in the engine and its cooling units. The latest model's engine cowl has been "cleaned up" (there is no projection on top of the cowl) and the cooler intake beneath the cockpit has been deepened. Otherwise, the fuselage is almost identical to that of the *Mustang I*.

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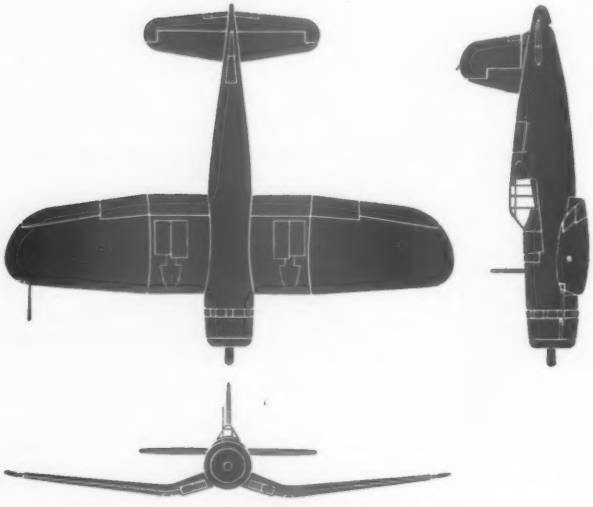
# VOUGHT CORSAIR

Fighter



PERTINENT FACTS: One of the Navy's top-notch fighters, the *Corsair* is being produced by the Chance Vought division of United Aircraft as well as the Brewster and Goodyear aircraft companies. Powered with a Pratt & Whitney 2,000 h.p. *Double Wasp*, the *Corsair's* top speed is slightly over 400 m.p.h. Service ceiling is over 35,000 feet, range more than 1,500 miles. Armament is six .50 cal. guns, three in each wing panel. Wing span is 41 feet, length, 33 ft. 4 in.; height 16 ft. 1 in.

WHAT TO LOOK FOR: The low, inverted-gull wing is the quickest means of identifying this fighter. In the bottom view, the wing is blunt and rectangular, with slight taper in the wing panels from the center section out to the deep, rounded tips. The fuselage has a long, slender nose, but becomes deeper from the cockpit to the tail. The rudder and fin are squat and chunky, while the elevator and fin are slender and tapering. Landing gear is fully retractable.

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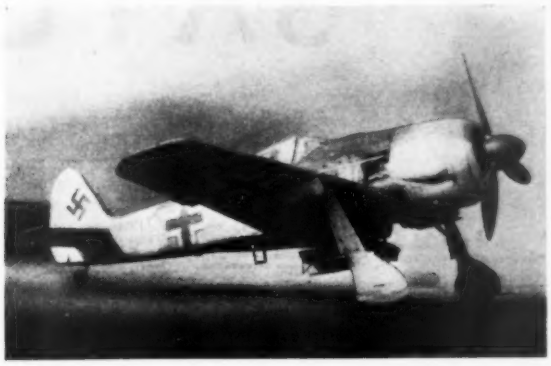
# FOCKE-WULF Fw-190A4

## Fighter-Bomber



PERTINENT FACTS: The silhouette of the Fw-190A3 fighter appeared in this section of the December, 1942, issue. Basically, the Fw-190A4 fighter-bomber is identical to the original fighter. The engine is the 1,760 h.p. air-cooled BMW 801D. Top speed with full load (at sea level) is 310 m.p.h. Wing span is 34 ft. 5 in., length, 29 ft. 1 in. Armament is restricted to two 20 mm. cannon in the wings, because of the bomb load. A single 550 lb. bomb is carried under the center section. This airplane is used for "sneak" night raids.

WHAT TO LOOK FOR: Main external difference between this version and the original fighter is the bomb slung under the fuselage, and the two wing-mounted fuel tanks for long-range flying. Otherwise the basic airplanes are practically identical.

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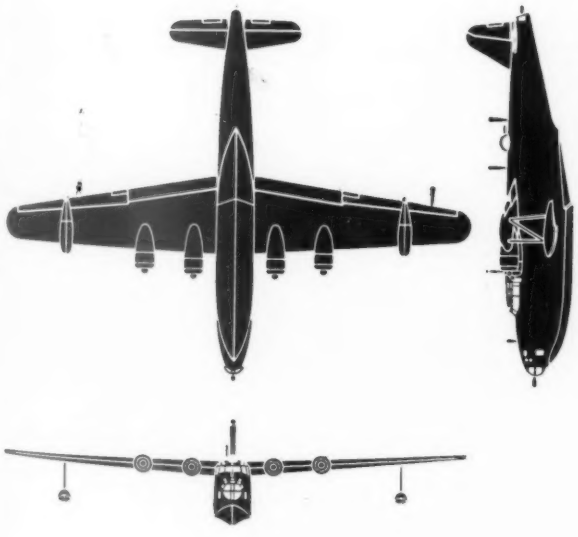
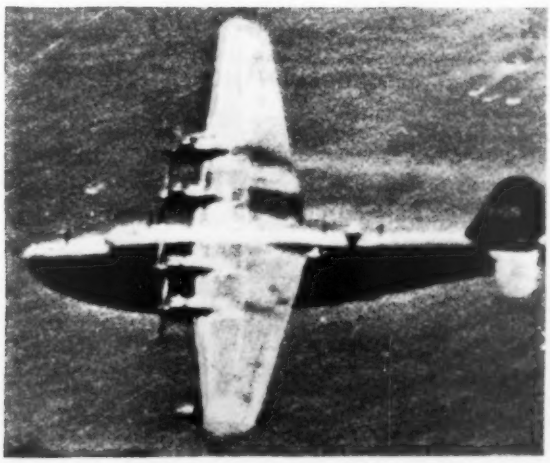
# "EMILY"

## Patrol Bomber





PERTINENT FACTS: Few facts have been released on this airplane by the Navy. Other sources, however, identify *Emily* as the Jap Kawanishi H-02 long range patrol bomber. It is powered with four air-cooled engines of about 900 h.p. each. Wing span is approximately 118 feet, length about 91 feet. Armament details are unknown. The photograph directly above was taken by the wing camera gun of a Navy fighter as it shot down an *Emily*.

WHAT TO LOOK FOR: A high-wing monoplane flying boat, the *Emily* looks a good deal like the RAF's Short *Sunderland*. The wing has narrow chord, moderate taper and pointed tips. The wing tip floats are fixed. The tail is conventional.

Provisional silhouette, copyright, FLYING, March, 1944.

# SATURATION

BASED on all available evidence as this goes to press, RAF concentration bombing on the continent will break all records during 1944.

This is a conservative view. Conceivably — say the optimists — concentration bombing, coupled with costly dividends now being paid by the Nazis on the Allied summer, fall and early winter air offensives, plus ground and naval activities on all fronts, may break the back of the Reich. Whatever happens, high-performance bombing records will furnish headlines as long as the continental conflict continues.

First of the history-making concentration records was achieved by the RAF at the height of the Hamburg attack. On Saturday night, July 24, 1943, more than 51 tons a minute were unloaded for 45 minutes.

The Hamburg record was broken at Hanover on September 22, when bombs were dropped at the rate of roughly 70 tons per minute—more than a ton a second.

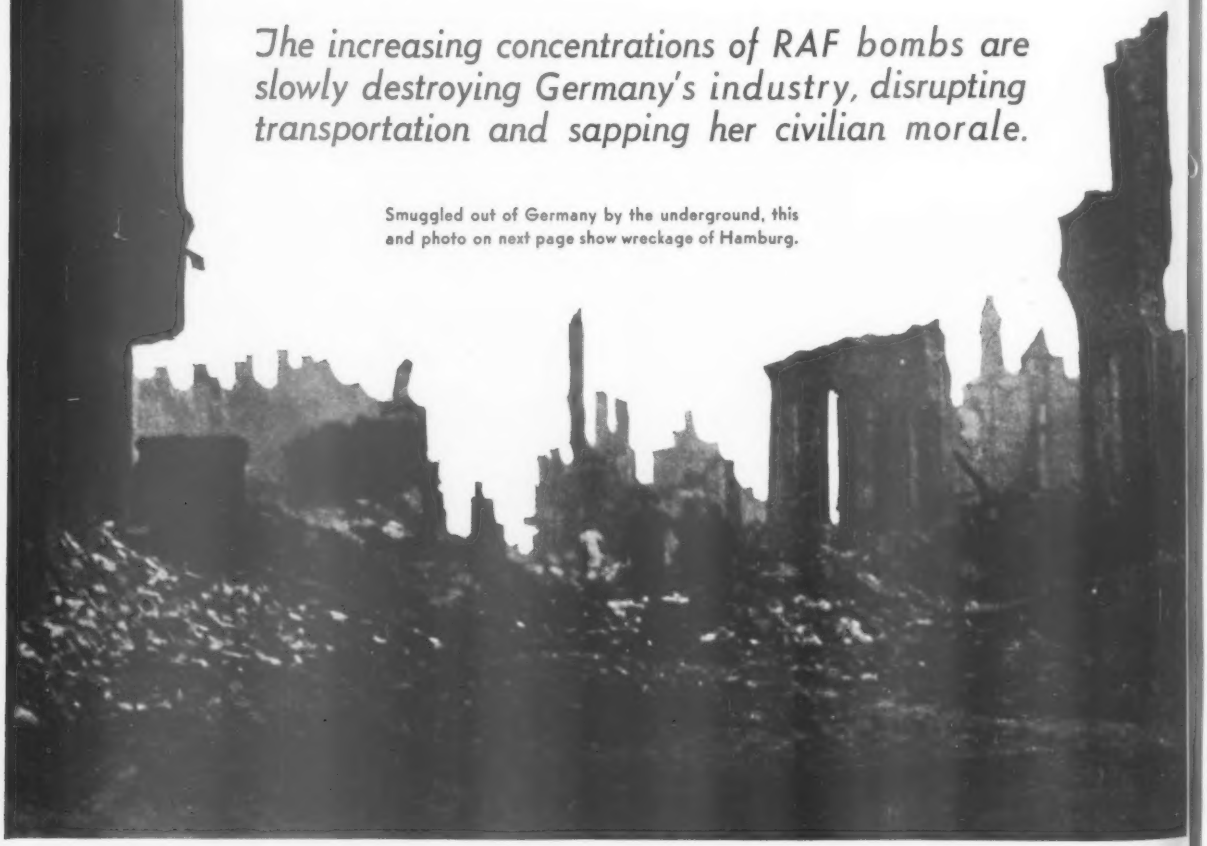
On November 3, at Duesseldorf, 74 tons a minute burst for 27 consecutive minutes —another high. And then, on November 22, in the opening days of the battle of Berlin, 2,300 tons were dropped at the new top rate of 77 tons per minute!

All returns are not yet in on the Battle of Berlin as this is written. Two heavy assaults within three days marked the opening of the New Year. On either of these, a new concentration record may have been achieved. Berlin may also be the scene subsequently of a number of concentration records as the fighting continues. Failing that, another German center may draw the dubious honor of getting more bombs in less time than any city before in history.

Another record, indeed, may be expected in your morning paper. Cold weather conditions may be credited with an assist. The RAF is unworried by cloud formations prevailing during the winter months, clouds having been pretty well eliminated from the problem of saturating a target with blockbusters. But icing conditions are something else again and they will undoubtedly cut down on the number of opportunities for winter raids. This means that when a good night does come, more planes will be available. More intensive service can be expected

*The increasing concentrations of RAF bombs are slowly destroying Germany's industry, disrupting transportation and sapping her civilian morale.*

Smuggled out of Germany by the underground, this and photo on next page show wreckage of Hamburg.



# BY FIRE . . . By FRED HAMLIN

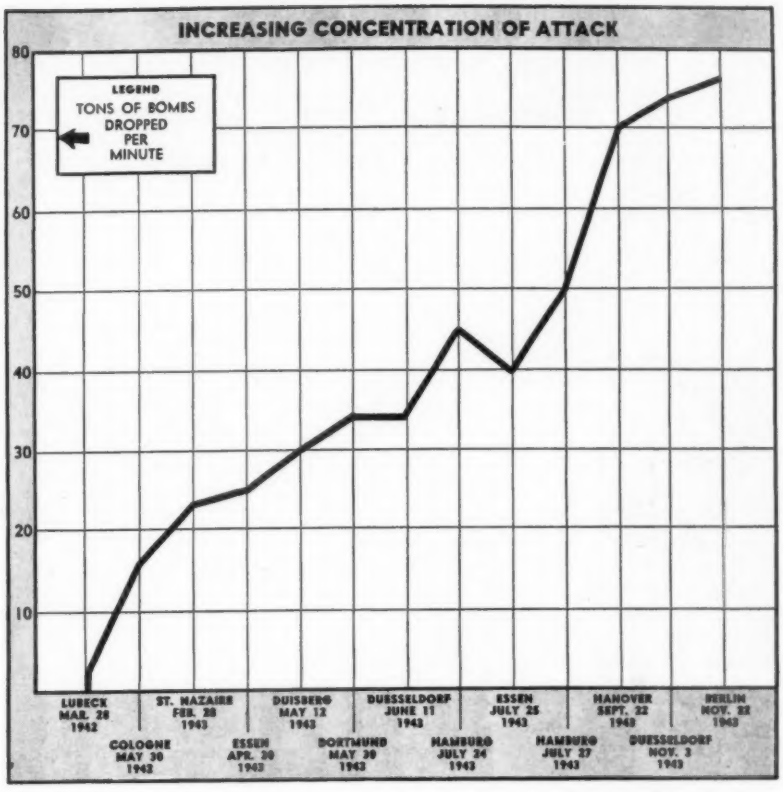
of ground crews, keystone of the successful concentration attack.

Behind the RAF record at Hamburg, for example, toiled 100,000 crewmen and women. Clustered around this raid, in addition, was also a diadem of blistering bomber runs—six days of unrelenting hammer blows, climaxed by the 2,300-ton record. More than 8,000 tons of bombs were dropped in 144 hours, a total greater than the Luftwaffe loosed on England between September, 1940, and July, 1941.

Five other ports and coastal industrial centers and three inland manufacturing cities were also attacked. Add this up and allow for the fact that Old Man Winter will demand more bombs in less time for the attackers to keep up to schedule, and you have in flaming red figures the score against Germany during the cold-weather months.

A full-paneled bombardment also accompanied the November 3 record at Duesseldorf. For 16 hours, bombers pounded this vital industrial center as well as Wilhelmshaven, Cologne and German airfields in France and the low countries to the tune of more than 4,000 tons of high explosives and incendiaries. Similarly, Berlin's record-breaking load was only a part of the downpour of

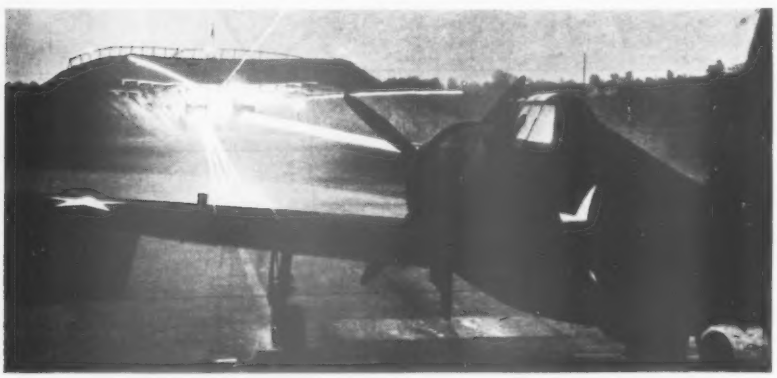
(*Continued on page* 162)




The increasing fury of RAF attacks is shown not only by total weight of bombs dropped (135,000 long tons in 1943) but by weight per minute in heaviest raids.

These skeletons of ruined buildings are but a small part of Hamburg's immense devastation.

Unusual new version of Douglas Havoc, flying away from Tulsa modification center. Note especially the streamlined belly housing containing special equipment, the squared wing tips and the solid nose carrying armament.



Propped-up Thunderbolt's eight .50-caliber machine guns disintegrate target in alignment check on test range while burning bits of powder ricochet off. Placement of guns outside idle four-bladed propeller's arc permits extremely rapid firing.

# HAVE YOU SEEN ?

At least 28 gun emplacements are visible on the starboard side of this carrier, indicating considerable modification since start of war. Taken from one of the ship's planes, photo shows zig-zag wake left by escorting destroyer hunting subs.

AAF M-3 steel helmet fits over regular leather helmet. Steel flaps held by chin straps cover the earphones.

Weather-sealed and lashed to the tie-down hooks on an escort carrier deck, 29 Thunderbolts are seen in the picture.

Proof of a gunner's life saved is this bullet-proof glass from Liberator rear turret with bullet half way through it.

The Svenska J-22, a Swedish fighter plane with air-cooled engine and four machine guns, resembles the Grumman Wildcat and the Focke-Wulf Fw-190. Its square-tipped wing has a span of 32 ft. 10 in.

Somewhere in Iraq, mechanics put the finishing touches to 50 Spitfires—part of a total of 4,690 airplanes which, complete with spare engines and parts, had been sent to the aid of Russia by Great Britain up to October, 1943.

# I Learned About Flying From That!—No. 54

By

Lieut. RAYMOND G. KRAMER

*This AAF instructor learned that even a veteran pilot asks for trouble if he ignores simple rules.*

IT WAS a typically hot desert evening and I had just taken off from our gunnery base at Ajo. We at Williams Field, Chandler, Ariz. use the Ajo base for giving our twin-engine pursuit cadets their prescribed rounds of aerial and ground gunnery. Our policy is to take off from Williams early in the morning, fly to our Ajo gunnery base and spend the day completing our missions. Upon finishing the scheduled flights, we fly back to Williams.

All the airplanes are carefully checked each morning before take-off. During the course of the day, there are usually minor repairs needed on the airplanes and we have mechanics on hand for such contingencies. These mechanics usually do an excellent job of keeping our planes in fine condition. On this particular day, everything had gone along smoothly; just a few gun jams and fueling difficulties had marred the day's activity. However, things like that are more or less expected. I had been the control officer that day and had gotten all the ships safely enroute to Williams, a 40-minute flight, before taking off for the home base myself. I was flying a Curtiss *Jeep*.

After leaving the Ajo base, I took up my heading back to the home field and had climbed about 1,000 feet when suddenly the plane began to vibrate. I immediately swung back over Ajo and assured myself that I could make the field, meanwhile, checking my instruments. The plane continued to fly in good fashion, the two engines performing normally, but the vibration continued. All my instruments were in order.

I felt that I should land and have the ship checked. However, it was getting late and I was tired and wanted to get home. So, I ignored my better judgment and headed for Williams, determined to get all the altitude possible. The territory between the two fields is a maze of mountains, canyons, and, generally, rugged terrain. There was no possible place to set the ship down safely. However, I thought that if I could get enough altitude before an engine cut out, I might be able to finish the trip on one engine. The *Jeep* is a heavy, two-place advanced trainer powered by two engines. It cannot hold its altitude on one engine alone, but I figured that if I could get high enough before something happened, I might make the home field.

I kept plugging away, nursing the ship up as much as possible, when I suddenly discovered something I'd ignored before taking off. The door handle on my side of the plane (the left side) had been broken off during the previous flight. I would not be able to open it from the inside. In getting into the plane before take-off, I had to get in from the right side, climb over the seat ordinarily occupied by a co-pilot and then get into my seat on the left side. In addition, the seat on the right side, which moves horizontally to facilitate entrance and exit on that side, was in the forward position. If the vibration had shaken one of the radial engines loose and it became necessary for me to jump, it would have taken me several minutes to work my way across the right seat out of the right door of the airplane. This was the situation as I anxiously edged the big, vibrating ship back toward Williams Field.

Ten minutes out of Ajo, my left oil pressure gauge suddenly dropped from the normal 65 pounds to zero. My sense of well being took a nose dive. However, both engines were still running, even with no oil pressure registering on the left gauge and the vibration steadily growing worse, so I continued to climb until it would not go any higher. I now had several thousand feet of altitute, although, I was still far below the normal ceiling of the ship. I got as much speed as possible out of it, occasionally glancing apprehensively at the uninviting scenery below.

Normally, one can look down from an airplane and get a conscious feeling of speed. However, it seemed to me that I was edging forward with the speed of an old model T Ford. I thought I'd never get back to Williams Field.

Presently, I spied the home field in the distant desert haze and began to breathe just a bit easier. No sight has ever looked better to me than Williams at that moment. A few minutes later, as I had been expecting, my left engine went out. I set the *Jeep* up for single engine operation and slowly lowered the nose to maintain a safe speed. Now that precious altitude which I had built up was going to be a life saver. I called the control tower and was cleared to land straight in. Upon my "Mayday" call, the control tower sent all planes out of the traffic pattern, so I had the whole field in which to land. I came in over the edge of the field at about 100 feet and made a fair landing . . .

An inspection of the left engine disclosed that one piston had come apart. Parts of it were lodged in the oil pump and in the lubricating system. I had flown home with one piston completely shot and parts of it were scattered throughout the engine. The engine had really taken a beating before it finally cut out.

In that one flight, I had several safety precautions drilled into me for life. Never take off without carefully running up the engines and checking the instruments thoroughly. Had I done that I would have noticed the vibration, for the piston would have gone out at that time instead of on take-off. Never take off with something wrong with the plane. In my case, I should never have taken off without a handle on the left door. As soon as something goes wrong in the air, set the plane down at the nearest airport or the best field available. Never try to make an extended flight, such as I did, when you know that you have a faulty engine.

No matter how many flying hours one may have logged, if he does not obey at all times a few simple obvious rules, he is going to run into serious trouble. END

Get This Free Booklet Telling

**WHAT YOUR TOWN NEEDS**

**for the Coming Air Age!**

YOUR life will be happier, fuller and more profitable in the coming air age. Your own private plane will save you time and money, take you to new and interesting places, increase your business activities.

When peacetime ushers in this great age of flight, the towns with landing facilities will beckon you—and thousands of other fliers. Will your home town be one of them? Will you be able to land there or will you have to waste valuable time driving back and forth from some neighboring town?

Your town officials must make their own decision. You, as an air enthusiast, can do much to show them the great advantage of landing facilities to your town, its business enterprises and all its citizens.

To help you and your town officials in laying practical plans for landing facilities, W. T. Piper, President of Piper Aircraft Corporation, has prepared a booklet, entitled "What Your Town Needs for the Coming Air Age." You'll find it full of workable ideas, sound advice and logical thinking. Get your free copy now—show it to your town officials. Write Piper Aircraft Corporation, Department PA34W, Lock Haven, Pennsylvania.

# AIRCRAFT OWNERS AND PILOTS ASSOCIATION

# AOPA NEWS

The Aircraft Owners and Pilots Association (AOPA) with National Service Office located in the Carpenters Bldg., Washington, and Registrar's Office in the Michigan Square Bldg., Chicago, is a non-profit organization composed exclusively of pilots. It looks after the pilot's best interests in all phases of aviation and helps individual pilots with their individual problems. The AOPA operates with a full-time professional staff and is the largest group of civilian pilots in the world. This column is edited by the Aircraft Owners and Pilots Association and opinions contained in it are not necessarily those of FLYING. A special Bulletin is sent each month to all registered AOPA pilots and also confidential memorandums from AOPA's Washington staff are sent members from time to time.

LAST month being the first of the new year, we sat down and endeavored to reorient our thinking and planning.

Number one project, the simplification of air-traffic rules, looks promising at the moment. **Douglas Robinson**, former War Training Service operator, has been undertaking a careful study for **William A. M. Burden**, special aviation assistant to Secretary of Commerce **Jesse Jones**, which is aimed to bring some added pressure to bear on the long-sought set of new air-traffic rules.

Meanwhile, the Safety Rules Division of the Civil Aeronautics Board, under the supervision of **Jesse W. Lankford**, has assured AOPA that only a few weeks' work remains to complete their recommendations which are understood to be an entirely new set of rules to replace the old and antiquated Civil Air Regulations Part 60.

We congratulate these two agencies for their present planning—late as it may be. The hope of all pilots is that these studies will not prove to be another "dud." This time we believe definite progress should be made. The industry, consisting of manufacturers, operators, and non-scheduled pilots alike, is counting on a drastic change in several parts of the Civil Air Regulations. Part 60, Air Traffic Rules, is the logical place to begin this modernization.

### AIRPORT FANTASY

A recent speech by the Administrator of Civil Aeronautics indicated that plans should be made to build double the number of present airports, or 3,000 new fields, for post-war aviation in the U. S. and that public funds in the amount of $800,000,000 would probably be required to institute such a program. By dividing the number of airports proposed into the total funds to be appropriated, we have determined that these airport sites newly proposed by the CAA would cost an average of $266,666 each.

This does not sound like a program for non-scheduled aviation. Airports in this category are luxuries even to air carriers, whose facility requirements are greatly in excess of those needed by non-scheduled aviation. Or to state the problem in another way, $266,666, the cost of one proposed airport, would be sufficient to build at least 134 private airports, including the average cost of grading, seeding, and erecting wind indicators, markers, shelters, etc.

AOPA objects strenuously to any airport program for the post-war period which does not specifically set aside adequate funds for the sole development of small non-scheduled airports and improvment of landing areas at convenient points for the accommodation of itinerant private pilots.

In AOPA's *Washington Newsletter* last month a questionnaire was distributed to all registered AOPA pilots, inviting attention to the airport situation and requesting specific locations for landing areas to accommodate non-scheduled flying. AOPA welcomes suggestions from non-pilot aviation enthusiasts and particularly from resorts which wish to provide landing areas for the accommodation of guests traveling by private airplane.

AOPA is compiling a list of landing-area sites on the basis of popular pilot demand which will be turned over to appropriate government agencies in connection with any future airport planning to be undertaken with public funds.

### CLEARANCE OFFICERS ELIMINATED

Last month found another milestone passed and another AOPA policy fulfilled in the announcement by the Civil Aeronautics Board of the elimination of flight clearance officers and the requirement for flight clearances at all points within the U. S., exclusive of the vital defense area. Two-way radio is no longer required except in the vital defense area.

To clarify this situation, it is pointed out that the issues of CAA's *Weekly Notice to Airmen* of December 30 and January 6 were in error insofar as they announced that the changes in the C.A.R. (Part 60.95) included a rescinding of the requirement calling for 24-hour airport guards. We wish that this might have been so, and AOPA is diligently working to eliminate this tremendous burden on the industry, but at the time of this writing 24-hour guards are still required at all designated landing areas.

### AVIATION FUEL SHORTAGE?

A new and serious hardship for non-scheduled aviation has just become apparent in the announcement of several leading aviation gasoline manufacturers that their production facilities would be devoted entirely, or in large part, to 100 octane fuel in the early part of 1944. This is presumed to be necessary in order to provide fuel for military aircraft in the quantities required for expanding air activities abroad, and no one can rightfully take issue with this urgent need.

In planning for aviation fuel production, it is hoped that Washington officials have taken due cognizance of the requirements of civil contract schools and CAA War Training Service programs which supply the initial training to the Army, Navy and other air services. Aircraft operated by these civilian components require aircraft fuel having octane ratings higher than that used by the family automobile but considerably lower than 100 octane fuel used by heavy horsepower military aircraft.

The services rendered by the Civil Air Patrol and by various individuals who fly civilian aircraft in connection with legitimate war work should also be properly evaluated and provision made for supplying necessary fuel. To all of these latter groups we urge patient co-operation and fuel conservation.

### ANONYMOUS LETTER

It is generally not the policy of AOPA to publish anonymous letters. The following unsigned document is reproduced because it summarizes briefly an often heard "squawk":

"Dear AOPA: I have just finished reading your latest article in FLYING Magazine ('Report from Washington' by **L. P. Sharples**, Chairman of AOPA's Exec. Com.). It seems that everyone is quite worried about the private pilot (civilian), his present and his future. What about the private pilot now serving in the Army?

"You mention that the 'less fit' may be 'grasshopper' pilots. Does anyone know that such a thing as liaison pilots exist, not only in the Artillery but in the Air Forces as well?

"Does anyone know that 'L' pilots in the Artillery are commissioned officers, but in the Air Forces the 'L' pilot may be anything from a buck private up to a master sergeant—and it stops there?

"Did you know that the planes the officer 'L' pilots fly are 65-h.p. while the Air Forces pilots fly 185-h.p. crates, do a greater variety of work with every branch of the service and stay non-coms?

"Why is it that women with 35 hours of flying time can get to fly heavier horsepower planes, but an enlisted pilot with a mere 600 hours of Army time and years of private flying cannot?

"Doesn't it seem to you that there is a tremendous waste of flying personnel in the Army Air Forces?

"Instead of trying to give the private pilot a break after the war, why not give him a break now—a little recognition for the work he is doing? He would sure appreciate it. Sincerely, An 'L' Pilot."

NOTE: The March and April (1943) editions of the AOPA *Pilot* were devoted in part to a complete discussion of pilot ratings and flight training in the Army, Navy, and Marine Corps, and how AOPA pilots in the services might apply for these ratings. END

# UMBRELLA

GRAVEST of all threats to a bomber is the presence of enemy planes "upstairs," planes that can attack at diving speed.

Republic P-47 Thunderbolts were designed to put an umbrella over our bombers. They're fast, long range, heavily armed fighter planes. Most important, *they fly high.* No enemy plane can get above the Thunderbolt umbrella.

Fighting up there around 30,000 to 40,000 feet, the P-47 is also pioneering new routes for tomorrow! And the men and women of Republic Aviation, designers and builders of the Thunderbolt, will be able counselors on long distance transport planes . . . planes that will fly above the weather . . . that will fly fast and far . . . through the thin, clear air of the true stratosphere. Republic Aviation Corporation, Farmingdale, L. I., New York, and Evansville, Indiana.

**REPUBLIC AVIATION**
CORPORATION
SPECIALISTS IN HIGH-SPEED AIRCRAFT

FARMINGDALE DIVISION

MAKERS OF THE *Thunderbolt*

# Letters

### FROM THE FRONT

Sirs:

There are several points on your article on "Aerial Gunnery" in the October, 1943, issue which I would like to clear up. . . .

Instead of having just got in my first burst, the truth is I had expended a can of ammunition when the plane went out of control. . . . I was not "wrenched" from the top turret. I went out the bottom hatch, past the lower gunner who had obviously been killed by a burst from the Focke-Wulf. It would be impossible for a gunner to go out through the bomb bay in a Douglas A-20B (or *Havoc*, as the author calls it).

Being the only one able to get out of the plane, I was quite naturally the only one able to get my parachute open before the plane crashed. Subsequent examination showed that the pilot and lower gunner had both been killed before the crash. After landing, I located the plane, pulled my pilot and fellow gunner out, and later turned their bodies over to the proper authorities.

The important point from a personal view is, of course, that I came out of it alive. However, I must say that the statement, "These and many more veterans are now back in the United States," came as somewhat of a surprise, for I was still flying missions in November and you probably know that the misadventure occurred in April. I have now completed my tour of duty and may (or may not) be allowed to go home for a furlough. . . .

S/Sgt. H. T. Ade

Somewhere in Italy

● A tut-tut to over-enthusiastic (and misinformed) Army public relations men who prepared material for the article on aerial gunnery.—Ed.

### MIXED NAMES

Sirs:

There have been several instances during the past few months in which I have seen certain well-known Army and Navy aircraft referred to by names other than the name by which they are best known. For instance, in recent Curtiss advertising I saw the AAF version of the Navy's *Helldiver* referred to as the *Shrike*. Which is correct?

C. I. Cass

Monmouth, Ia.

● Peculiarly enough, Curtiss is wrong in naming its own plane. Whether the version be the Navy's SB2C, the Army's A-25 or the version being supplied to our Allies, the airplane should be referred to *only* as the *Helldiver*. This practice conforms with a joint Army-Navy announcement issued January 3, 1943, to the effect that only one popular name will be used for each American aircraft, no matter how many different branches of the Allied armed forces use that airplane. There have, however, been numerous departures from the practice since the Army-Navy announcement. The Army version of the Douglas *Dauntless* sometimes is referred to erroneously as the *Banshee;* the dive-bomber version of the North American *Mustang* is mistakenly called *Invader*. Flying's editors recently called many of these discrepancies to the attention of Army and OWI officials. A new Government announcement on this subject is expected to be made shortly—Ed.

FLYING

"As evidence of good faith, the designer has agreed to test hop it with you."

### THE JU-90

Sirs:

In your December issue was a picture of what you called a Junkers Ju-290. Am I correct in calling it a Junkers Ju-90?

Lloyd W. Harris

Miami, Fla.

● Right. The Ju-290 is a bomber and transport based on the Ju-90 and differs from it mainly by having a re-designed outer wing which incorporates a rectangular center-section and outer sections with equal taper on leading and trailing edges. The Ju-90 also has a twin-tail rudder which comes out and goes forward over a vertical fin, whereas the rudders of Ju-290 do not overlap.—Ed.

### PRIVATE FLYING

Sirs:

L. P. Sharples' ideas on restoring private flying are too good not to be heard by everyone. Why don't you do your best to see to it that wartime restrictions on flying are reconsidered?

Out here at Boeing Aircraft many of us who formerly flew nearly every week are now ruining our eyes building *Flying Fortresses*. We need the *Forts* and are glad to build 'em, but why not some flying allowed on week-ends?

Jerome C. Baer

Seattle, Wash.

● Mr. Sharples' organization, the Aircraft Owners and Pilots Association, is doing good work on this fight. Restrictions on private flying are gradually being eased. For example, flight clearance is no longer necessary outside vital areas. —Ed.

### TRIBUTE

Sirs:

I am writing to tell you how I appreciate the tribute paid my late husband, Lieut. Ernie W. Weyle, D.F.C., in publishing his story in your December issue.

Since being interviewed by Mr. Williams, he met his death in a plane accident at his base in Texas. Unfortunately I was unable to join him in Texas, as my arrival in the United States from England occurred at approximately the same time as the accident.

Anne Weyle

Burlingame, Calif.

### WTS DEFENDED

Sirs:

I have read your articles about civilian instructors and I am wondering if you might run one concerning WTS instructors.

There seems to be much doubt in many persons' minds concerning these fellows. Due to the fact that they wear Army uniforms, many people think they are civilians wearing these uniforms to be big shots, when in reality they are in the Army Reserve and teach regular Army men.

I am the wife of one such instructor and am disgusted with the attitude taken by the people of this and other communities concerning this matter.

Mrs. John T. Blocher

Rochester, Minn.

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"The great importance of weight reduction in airplane manufacture cannot be overemphasized. In the case of military craft, reduced weight is, of course, translated in terms of increased firepower, range, armor, speed; its measurement in dollars-and-cents value is impossible. But when *commercial* planes are considered, the saving of even one ounce is reflected in a plane's enhanced productivity from a financial point of view. On Eastern Air Lines, for instance, one pound of payload is worth, conservatively, over $80 of revenue during the first 5 years of the life of a plane."

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- "Outlast the plane."

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*"There's No Excuse for a Nut Shaking Loose"*

Boots Aircraft Nut Corporation, General Offices, New Canaan, Conn., Dept. N.

# THE LIBRARY

**VERTICAL WARFARE; by Francis Vivian Drake; published by Doubleday, Doran & Company, New York, in 1943. 149 pp. Price $3.00.**

Mr. Drake was a fighter pilot in the last war and is a civilian aviation expert whose views are entitled to considerable respect. In this book he has attempted to analyze the capacity of strategic bombing to defeat Germany, a field already covered by two able men, Ziff ("The Coming Battle of Germany") and Michie ("Air Offensive Against Germany"). He presents some new material and a large number of excellent photographs. (Most or all of them from the Army Air Forces.)

As he sees it, Germany has lost the war but the United Nations have not yet won it. Disregarding the vitally important role of the Red Army, Mr. Drake sets forth a double-barrelled question about how the final defeat is to be administered. Shall the blows which bring Germany to her knees be delivered by massed (Anglo-American) air power with bombs, or shall we deliver these blows by the traditional methods of land power and gunfire? He feels that the fate of millions of Allied lives "which must inevitably be sacrificed if the pendulum swings toward unpaved land invasion" hangs in the balance.

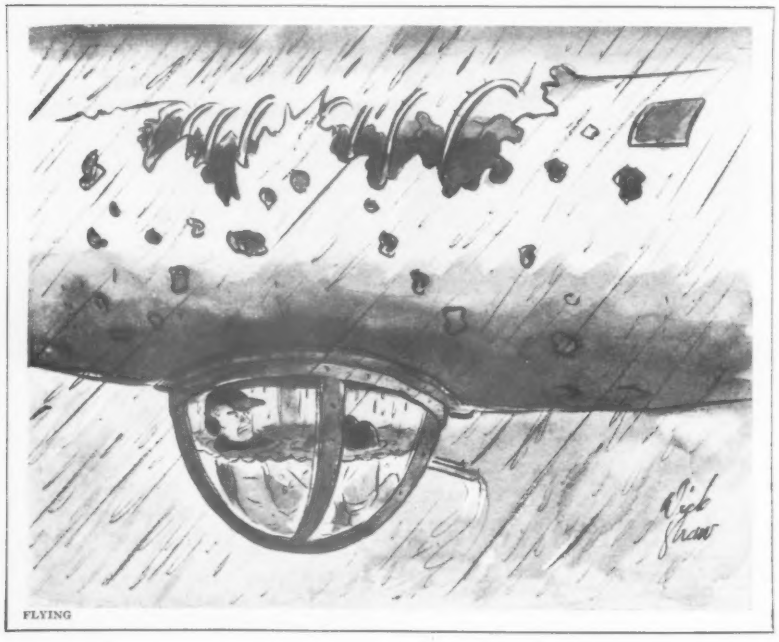
In order to demonstrate that Germany can be defeated in six months by strategic bombing at a much lower cost in Allied lives and treasure than will be required if we invade the continent, he analyzes the capacity of the modern bomber to inflict damage on the war industrial centers of the Reich. Where he differs from other writers is on his estimate of the bomb tonnage and time required to cripple Germany. In one case he follows the estimate of 30 key industrial centers destroyed. In another estimate he sets a total of 240,000 tons of bombs dropped in six months as sufficient to cause a German collapse.

Now it happens that the total bomb tonnage dropped by the RAF and the Eighth USAAF is approaching the 209,000-ton mark but as yet the Reich's capacity to wage war has not been greatly weakened. It is true that this tonnage has not been dropped in a six month's period, but it raises doubts about the validity of any flat estimate of bomb tonnage required to cripple a modern industrial state.

Mr. Drake is on doubtful ground in his assumption that land invasion will necessarily be accompanied by the 50 per cent casualty rate which he attaches to the "traditional methods of land warfare." Allied casualties in Tunisia were regretably heavy, but they were *very* light compared with the standards set by Mr. Drake. The experience in Sicily confirms this and so do the losses in Italy up to the present.

A good deal of Mr. Drake's argument falls down on the simple fact that *so far* the invasion of Europe has not been along the "unpaved" road he sets up as the alternative to strategic bombing. It is not a question of defeating Germany by strategic bombing *or* by the "costly methods of traditional land warfare." We may see a combination of many methods: a wearing down of the Wehrmacht by the Red Army, a strategic bombing program, and an Allied land invasion of western Europe on the air-ground co-operation model set up in North Africa.

CAPT. H. A. DE WEERD
Associate Editor
"Infantry Journal"



FLYING

**TAKE 'ER UP ALONE, MISTER, by Lieut. John J. Hibbits, AC, as told to F. E. Rechnitzer; published by Whittlesey House, New York, in 1943. 234 pp. Price $2.50.**

The prospective flyer who wants to find out how it feels to be an aviation cadet in the Army's flight training program can get the flavor and taste of Army Air Forces flying by reading Lieutenant Hibbit's first-hand experiences. Contrary to the recent trend which has presented air-minded youth with "how to do it" books on flying, this first-person narrative purposely avoids the technical aspects of flying in favor of painting an over-all picture of it.

Liberally sprinkling his book with action photos of cadet life, the author describes the pre-induction red tape, which, after the usual bureaucratic delay, admits him to San Antonio for classification, later to pre-flight training, then to actual flying. Although Hibbits doesn't set foot in an airplane for the first 67 pages, the space is well spent in letting the reader know how it feels to be hazed by an upperclassman and to carry on while waiting to fly. And, just before he "takes 'er up alone," his actions are typical of the way a student can despair while waiting to pass (or fail!) his flight check.

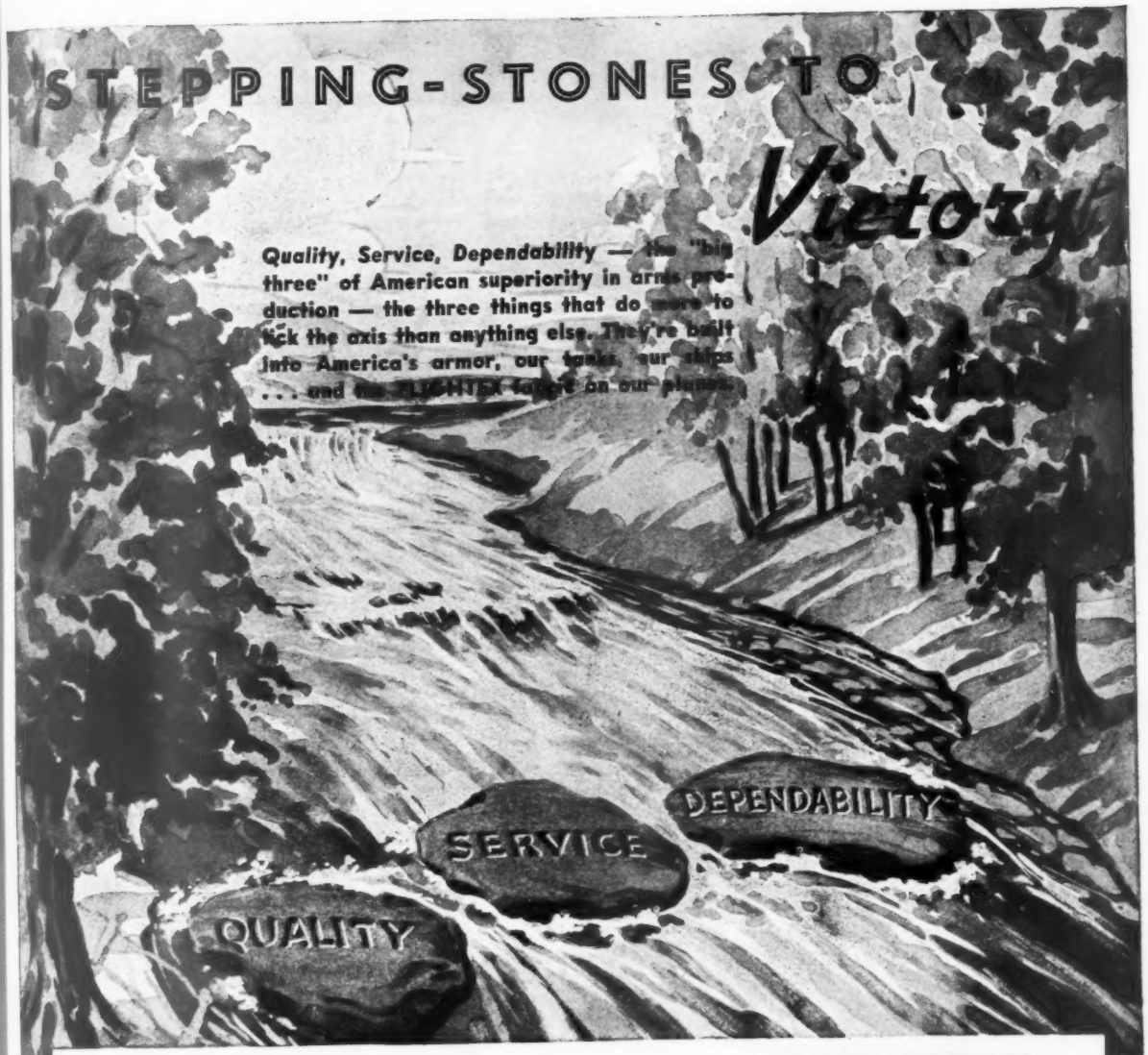
The book is tinged with real flying flavor and is, as we have said, more concerned with what it *feels like* to be an aviation cadet than what a cadet *must do* to fly the plane successfully. For this reason, "Take 'er Up Alone" should be interesting reading for the thousands of parents who would like to know just what treatment their sons receive during flight training and how those young men feel when they pass the strenuous course that entitles them to a second lieutenant's bars in the U. S. Army Air Forces.

JOHN R. HOYT

**AEROSPHERE'S MODERN AIRCRAFT; edited by Glenn D. Angle; published by Aircraft Publications in 1943. Price, $7.50.**

This is an apparent attempt to create an American "Jane's All the World's Aircraft." It is one of the four sections of "Aerosphere," presented as a separately bound volume. It amounts only to a rebinding of the 1941 edition of "Modern Aircraft of Aerosphere," with a 16-page supplement describing later planes, although the volume has only recently been published.

The volume claims to report all "available" information on every airplane known to be under construction at the time it goes to press. It also contains information on a number of experimental models or projected models. There are 590 illustrations in all and descriptions of the aircraft of 28 nations. Illustrations of every plane described would be extremely valuable in future editions. The book is attractively bound and printed on excellent paper.—C. F.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Nor will all this newer luxury be costly. Air transportation companies predict they will be able to carry the average man at a price he can afford.

These are facts for tomorrow. It is good to know that American aviation is ready to contribute to a world of peace and general opportunity. Until that day the sweat and talent of Northrop and every other U.S. aircraft designer and builder are concentrated solely on making deadly and still more deadly planes of war.

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# What's a HELICOPTER ENGINE look like?

THAT'S a question lots of people have been asking—and here you have one answer. For here for the first time is shown a Franklin aircraft engine designed to power post-war helicopters and already in use in several experimental installations.

It's been compared in appearance to a boiler or a diving bell, but actually it's a six cylinder, opposed, air-cooled engine. Fundamentally, it's very like a conventional Franklin engine, except that it is mounted vertically directly below the main rotor shaft, and almost completely covered by an air housing, which directs air for cooling over the engine from an engine-driven fan.

Aircooled Motors has been making Franklin helicopter engines for almost four years. It was a Franklin that powered the Sikorsky ship which broke the world's helicopter endurance record in 1941. It was a Franklin which powered the PV-2, latest helicopter to make a public demonstration flight. And Franklin engineers are working steadily to bring helicopter engines to ever-higher levels of performance, so they'll be ready to go into production quickly with efficient engines for your post-war helicopter.

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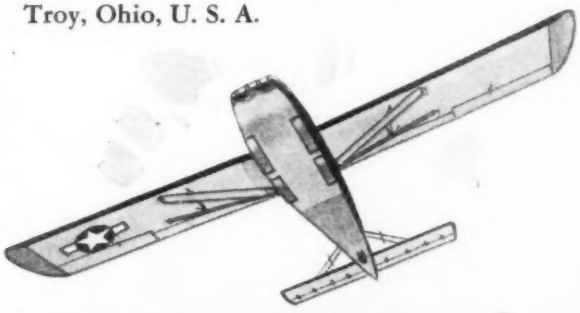
Not so many hours ago, this G.I. stopped one with his name on it. In his grandfather's day—or even his father's—the odds would have been against him. Now, though, thanks to the wonders which modern medicine and modern transport are working at the front, it's almost a sure thing that he'll make the last leg of that long journey home on his own two legs.

For this fighting man and many others, the trip back to Main Street begins in the giant gliders designed and built for the Army Air Forces right here at WACO. On these missions of mercy, WACO gliders have repeatedly demonstrated their effectiveness... just as they have on many a mission of mayhem far behind the enemy's lines. THE WACO AIRCRAFT COMPANY, Troy, Ohio, U. S. A.

*Eleven other manufacturers also are building* WACO *gliders for the AAF, using* WACO *design and engineering supervision. Their many uses include the transport of air-borne infantry in battle . . . the transport of vital personnel and supplies to and from the front lines.*



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ALL ARMY CARGO-TRANSPORT GLIDERS ARE WACO DESIGNED

## Production by Repair

(*Continued from page 64*)

pots of the RAF Maintenance Command operate with the salvage organization, which has numerous salvage centers all over the British Isles. This organization's main purpose is to pick up crashed aircraft and take them and their equipment to the appropriate repair depot, either civilian or service, or to the sorting depot.

In September, 1940, came the Battle of Britain, the intensity of which exceeded all calculations. Crashes from air combat mounted and, simultaneously, production capacity was lost through enemy action. The gap between intake and output widened and, in addition, a great strain was placed upon the salvage organization. If damaged aircraft were to be returned serviceable to the RAF in the least possible time it was essential that the salvage organization be greatly strengthened.

Today the repair organization is based upon repair being carried out under three distinct conditions:

(a) Minor repairs and overhauls at RAF units.

(b) Major repairs and overhauls at service repair depots.

(c) Major repairs and overhauls at civilian repair firms.

There are several service repair depots and, in general, certain depots repair all types of equipment, the remainder concentrating on a more limited range. Labor is provided by RAF personnel and from civil sources. Women are employed through both agencies.

Each SRD is divided into sections dealing with engines, airframes and armament. All fixtures, test rigs, jigs and special tools necessary for major repair and overhaul are provided and the work is under the direct control of the chief technical officer. In addition to repairs and overhauls, modifications are also carried out and at some SRD's certain secret equipment is fitted to new aircraft arriving from contractors.

Replacements and spares for repair are obtained from the regional universal equipment depot (UED). (A number of these depots are dispersed throughout the country.) They are the stock-holding units of the RAF and squadrons all over the world are supplied from them. They also supply the civilian industries with spares for repair.

The Directorate of Repair and Maintenance is divided into branches, each covering some specific equipment, such as airframes, engines, radio, ground equipment and so on. DRM is closely concerned with the design of equipment from the maintenance standpoint, and the amount of repairs that may be carried out is dependent upon this maintenance design.

It is essential that aircraft should be so designed that they can be easily dismantled and that the aircraft when so dismantled lend itself to road transport conditions. Provision should be made in the original design of aircraft to allow jacking and rough handling. This is especially necessary with large aircraft.

An example of the effect of design on transportation is illustrated by the *Liberator*. This aircraft breaks down into several main assemblies, the largest of which—the fuselage with inner wings—is 55 feet wide. It cannot, therefore, be moved by road and must be repaired on site even if severely damaged, always supposing it can then take off from the crash site. Apart from transportation and repair problems, ease of maintenance in the service has to be considered. All this is a responsibility of the Directorate of Repair and Maintenance.

The actual operation of this system of salvage and repair takes the following course: as soon as information reaches headquarters, the regional salvage center is informed and an automobile is dispatched, taking a crash inspector, armorer and electrician.

The crash inspector categorizes the aircraft and informs headquarters accordingly. There are six categories: A, AC, B, C, D or E. Categories C and D are applied to those aircraft that cannot be economically repaired but are useful for instructional purposes.

Category A is used when it is considered that the aircraft may be repaired by the RAF unit. Should the unit be unable to do this work for any reason, the aircraft will come under Category AC and either an RAF mobile repair party from the nearest salvage unit or a civilian mobile repair party will be called in to help.

Category B refers to those aircraft that can only be repaired at the original factory. In such cases it is usual to repair the aircraft sufficiently to allow its being flown to the contractors' plant, where the complete repair is carried out.

Category E refers to aircraft which cannot be repaired and which do not serve any useful instructional purposes. This aircraft will be allotted to a civilian contractor specializing in Category E aircraft. It will be broken down and all salvaged parts stored as spare parts for repairing that particular type. The scrap remaining is sent for melting down.

Materials from British and enemy aircraft and collections from factories yield approximately 30 tons of light alloy a week.

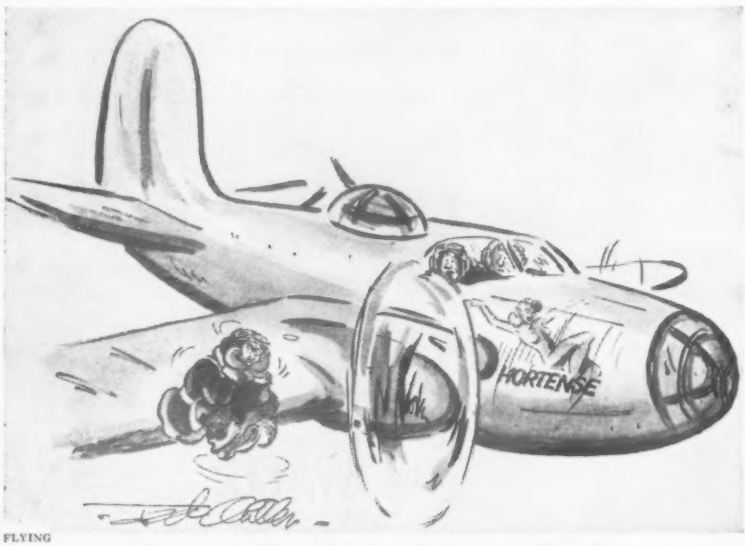
After categorization, armorers and electricians detach all removable equipment, such as guns, bombsights, radio sets and so on, which are then returned to a Repairable Equipment Depot (RED). No repair work is carried out there but the removable equipment is sorted and sent to one of the hundreds of repair centers. This arrangement insures that the supply of repairable equipment is fed fairly between the firms and SRD's undertaking repair.

While all equipment is being stripped off the aircraft, the salvage unit concerned sends out appropriate pickup vehicles, complete with mechanics, a mobile crane, and all special tools and tackle required to take the aircraft to pieces. The CRO is notified and a contract for its repair is sent to a repair firm. In the case of an aircraft going to a SRD no contract action is necessary.

The aircraft is now reduced to its main assemblies, loaded onto the vehicles, and taken direct to the repair center given in the block allocation. The chief AID inspector goes all over the aircraft and tabulates the amount of work to be done and the parts to be replaced.

The rebuilt aircraft is flown to an aircraft storage unit (ASU) where the removable equipment—some of which has been through repair and is now equal to new in every respect—is installed.

When the aircraft leaves the repair center the cycle is complete and another aircraft is struck off the list of "aircraft under repair." END

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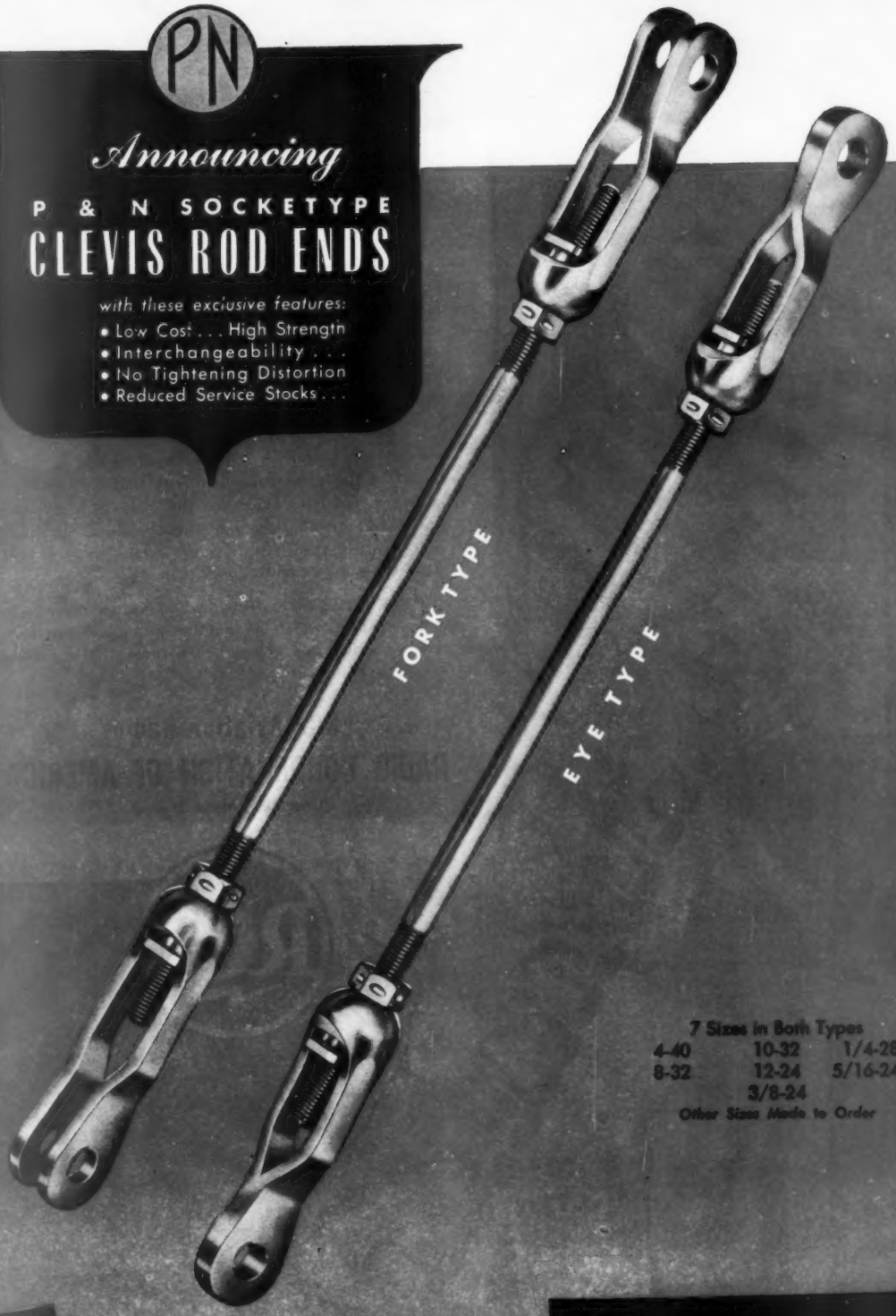


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Every detail of RCA Aviation Radio design is conditioned by this grim demand for equipment that will *do* more — *weigh* less. Typical is the 1944 RCA Aviation Radio "I.F." transformer shown here beside an equivalent unit of a few years ago. The 1944 transformer is 80% smaller, yet does a better job.

This I. F. transformer is but one of many aviation radio components in which RCA research and redesign have reduced weight and volume while constantly improving over-all aviation performance.

**RCA Aviation Radio**

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**Camden, New Jersey**

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**It's a mighty important** hose he's shooting at, and he'd better score plenty of hits. For this hose is the vital link between an airplane's fuel tanks and its engines . . . a link whose failure due to punctures could mean the loss of plane and crew. That's why he wants his .50 calibre bullets to hit and hit again . . . to see if the hose can take it.

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because **KOH-I-NOOR Drawing PENCILS** can be depended on for sharp . . . crisp lines which produce sharp, clean prints...

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**NO. 1700 – TECHNICRAYON PENCILS**
Made in 40 brilliant colors. Each pencil is polished in the color of the lead . . . for easy identity. Available in sets only of 12 or 24.

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The RIGHT pencil for the RIGHT job

KOH-I-NOOR PENCIL COMPANY, INC.
BLOOMSBURY, NEW JERSEY

## T for Turnover

(*Continued from page 28*)

are naturally slow in being compiled. But the following report by the seven companies within the AWPC represents one of the worst turnover months of 1943:

| Termination Causes | Men | Women | Total |
|---|---|---|---|
| **A. Military** | | | |
| 1. *Mandatory* | | | |
| a. Selective Service | 608 | 0 | 608 |
| b. Reservists | 69 | 1 | 70 |
| Total mandatory | **677** | **1** | **678** |
| 2. *Voluntary* | | | |
| a. Air Corps | 213 | 6 | 219 |
| b. Marines | 37 | 15 | 52 |
| c. Coast Guard | 22 | 8 | 30 |
| d. Army | 99 | 42 | 141 |
| e. Navy | 271 | 40 | 311 |
| f. Merchant Marine | 100 | ..... | 100 |
| Total voluntary | **742** | **111** | **853** |
| 3. *Anticipated* | 88 | ..... | 88 |
| Total military | **1,507** | **111** | **1,618** |
| **B. Health** | | | |
| 1. Personal illness | 725 | 1,476 | 2,201 |
| 2. Personal injury | 31 | 32 | 63 |
| 3. Pregnancy | ..... | 453 | 453 |
| 4. Physical (Unadaptable) | 171 | 249 | 420 |
| 5. Other | 78 | 116 | 194 |
| Total health | **1,005** | **2,326** | **3,331** |
| **C. Working Conditions** | | | |
| 1. Wages | 348 | 85 | 433 |
| 2. Hours | 84 | 43 | 127 |
| 3. Shift | 54 | 107 | 161 |
| 4. Nature of job | 478 | 467 | 945 |
| 5. Supervision | 84 | 44 | 128 |
| 6. Claims unused skill | 111 | 26 | 137 |
| 7. Future of job | 89 | 21 | 110 |
| 8. Job classification objection | 59 | 32 | 91 |
| 9. Associates | 18 | 9 | 27 |
| 10. Denied transfer to other job | 97 | 119 | 216 |
| Total working conditions | **1,422** | **953** | **2,375** |
| **D. Living Conditions** | | | |
| 1. Transportation | 275 | 344 | 619 |
| 2. Housing | 103 | 50 | 153 |
| 3. Unsatisfactory food supply | ..... | ..... | 0 |
| 4. Unsatisfactory locality | 6 | 5 | 11 |
| Total living conditions | **384** | **399** | **783** |
| **E. Personal Affairs** | | | |
| 1 Child Care | 5 | 1,124 | 1,129 |
| 2. To be with spouse | | | |
| a. Military | 8 | 989 | 997 |
| b. Civilian | 12 | 203 | 215 |
| Total to be with spouse | **20** | **1,192** | **1,212** |
| 3. Illness or death in family | 346 | 639 | 985 |
| 4. Deceased | 44 | 13 | 57 |
| 5. To get married | 4 | 395 | 399 |
| 6. Returning home | 722 | 1,435 | 2,157 |
| 7. Other family reasons | 354 | 1,013 | 1,367 |
| 8. Hazard of combat area | 1 | ..... | 1 |
| 9. Better job | | | |
| a. Other aircraft | 27 | 6 | 33 |
| b. Shipyards | 9 | ..... | 9 |
| c. Other essential | 118 | 25 | 143 |
| d. Non-essential | 60 | 32 | 92 |
| e. Civil Service | | | |
| 1. Military | 17 | 8 | 25 |
| 2. Non-military | 27 | 11 | 38 |
| Total Civil Service | **44** | **19** | **63** |
| Total better job | **258** | **82** | **340** |
| 10. Return to former job | | | |
| a. Farm | 296 | 72 | 368 |
| b. Other | 709 | 465 | 1,174 |
| Total return to former job | **1,005** | **537** | **1,542** |
| 11. Return to school* | 3,153 | 1,305 | 4,458 |
| 12. Unreported absence | 74 | 99 | 173 |
| 13. Unknown | 6 | 24 | 30 |
| Total personal affairs | **5,992** | **7,858** | **13,850** |
| **F. Dismissals** | | | |
| 1. Violations of company rules | 162 | 43 | 205 |
| 2. Insubordination | 89 | 22 | 111 |
| 3. Sub-standard production | 68 | 43 | 111 |
| 4. Attendance | 180 | 300 | 480 |
| 5. Personal record unsatisfactory | 38 | 12 | 50 |
| 6. Refusal to comply with maintenance of membership | ..... | ..... | 0 |
| 7. Miscellaneous | 96 | 183 | 279 |
| Total dismissals | **633** | **603** | **1,236** |
| G. Layoffs | 35 | 3 | 38 |
| Total all terminations | **10,978** | **12,254** | **23,232** |

*Summer vacation ended this particular month, with student workers returning to school.

Further interesting statistics uncovered by the panel show that of all the workers quitting their jobs in a single month, 3.95 per cent of the women and 3.68 per cent of the men worked only 15 days or less.

Those who did not work a full year numbered 45.51 per cent of the women and 39.49 per cent of the men. At that rate, approximately 85 per cent of the total number of persons hired that year left jobs on the airplane production lines to do something else.

Panel members also found that the majority of women now

(*Continued on page 97*)

# The Guy on the Ground Crew

Sure, the guy who stays on the ground wins battles in the sky.

He works at an improvised airfield many miles from nowhere. He services battle-scarred planes to fly and fight again. He, *literally*, keeps 'em flying!

The skill of our aviation mechanic is one military asset the Axis can't copy. It's partly the product of a superb training program. Partly, a mechanical knack for making things work.

We like to think that there's something of this typically American genius in the way men and women of Bell Aircraft build the U. S. Army Airacobra. They started with the idea of a "cannon on wings." To make this idea work, they designed a swift, single engine, cannon bearing fighter. They're building 'em—fast!

They ask no higher praise than to be considered team-mates of the guy on the ground crew.

File this thought away for postwar reference. The men and women of Bell Aircraft will be ready for their assignments . . . ready with a war born habit of *thinking* new planes, techniques for designing, engineering and building them, a knack for making them work. © Bell Aircraft Corporation, Buffalo and Niagara Falls, New York.

MEMBER AIRCRAFT WAR PRODUCTION COUNCIL—EAST COAST, INC.

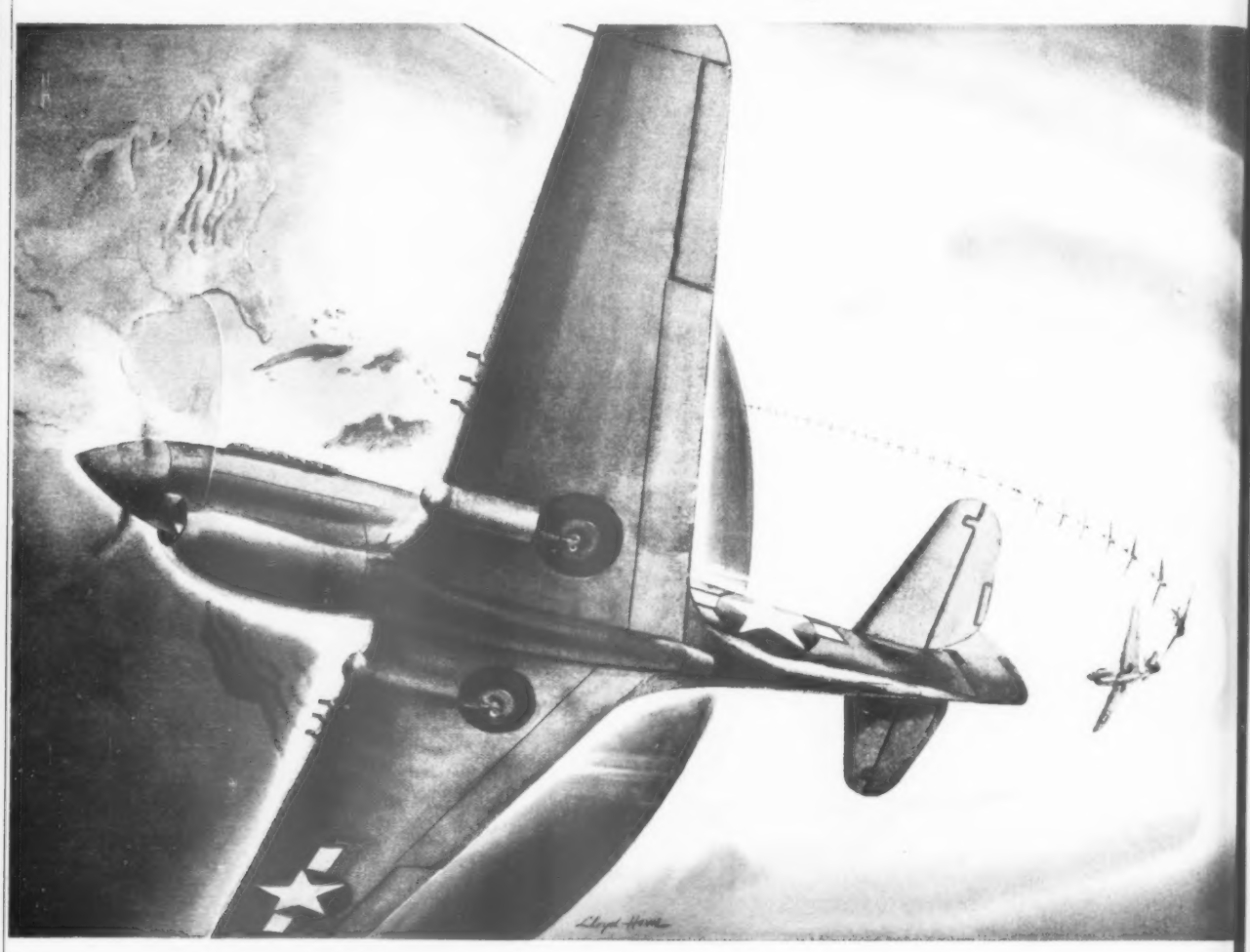
**BELL** *AIRCRAFT*

Niagara Frontier Division, Buffalo and Niagara Falls, N. Y.
Ordnance Division, Burlington, Vt.
Georgia Division, Marietta, Ga.

**PACEMAKER OF AVIATION PROGRESS**

BUY WAR BONDS AND SPEED VICTORY

# THAT OUR COUNTRY MIGHT *Take Wing* AGAINST THE ENEMY



## *Curtiss-Wright built FIRST and MOST . . . Flying 20 seconds apart, Curtiss Fighters would encircle the globe!*

☆ FIRST and MOST—a sensational claim—yet not to be disputed! Curtiss radial engine Hawks for France and Mohawks for England in 1939! Curtiss in-line engine Tomahawks in Libya and China in 1940 and 1941! The higher performance Curtiss Kittyhawks in global warfare in 1942 and in 1943 and 1944 an even more powerful fighter—the Curtiss Warhawk.

☆ The FIRST German plane fell victim to a Curtiss Fighter over France—the first Jap plane over Pearl Harbor! In fifty authenticated aerial engagements Curtiss Fighters ran up a bag of 13½ enemy planes for each Curtiss Fighter lost.

MEMBER, AIRCRAFT WAR PRODUCTION COUNCIL, EAST COAST, INC.

☆ MOST, by far! If all Curtiss Fighters built since hell broke loose throughout this world could take off at top speed from one huge base, they would form a deadly circle of flying might 25,000 miles in circumference—a tornado of power and a living symbol of American aerial supremacy that would encircle the globe.

Another Contribution of

**Curtiss-Wright Corporation**

AIRPLANE DIVISION

Toward Winning This War

BUFFALO • COLUMBUS • ST. LOUIS • LOUISVILLE

(Continued from page 94)

seeking employment are stenographers, clerks and other office workers, who have no desire to do actual production work. Most of the non-production jobs are filled, however, and the woman who doesn't wish to don coveralls and work on the assembly line is being turned away.

In an effort to retain their employees and increase individual productivity, the companies carry on many activities.

Job classification is one of the first steps. A new employee is placed as often as possible into the job for which he is best fitted and the one at which he is likely to be more happy. Then the next phase is to interest the worker in the company— making him feel he is a valued part of the organization. Safety and health come next, with medical service and insurance programs available at minimum costs.

Working conditions are constantly being improved. Besides the best possible heating and lighting arrangements in the factories, the companies also operate clean cafeterias or dining rooms; provide rest periods, during which there is entertainment for all employees; set up transportation and housing committees as outside services; provide recreational facilities; seek child care services for working mothers; give financial aid in many ways; offer legal advice and free notary service.

In spite of all these programs to safeguard workers, improve their morale and alleviate their needs and demands, Turnover continues at the average rate of 17,000 per month.

At the moment, there seems to be no way to curtail terminations unless legislation embodying President Roosevelt's proposed national service law is passed by Congress.

One company executive said that workers are becoming too complacent about the outcome of the war, believing that it will be over so soon that their services between now and the end of hostilities will not be missed. This trend of thought also is keeping new workers from taking employment, it was said.

Others also are hindered from seeking employment by the curtailment of gasoline and the housing situation. Most of them in the sprawling Southern California area live too far from the plants to attempt to get there by public transportation. These two problems are being given close consideration presently, however, and are hoped to be improved upon soon.

Specific work being done by other panels created by the AWPC in an effort to reduce Turnover and utilize all manpower, include:

INDUSTRIAL RELATIONS COMMITTEE: Cooperating with the West Coast Manpower Directive, which was instituted to curtail manpower shortages threatening warplane output.

SELECTIVE SERVICE PANEL: Seeking draft deferment for employees whose induction would cripple production, and working out a program to obtain possible work furloughs for vital aircraft employees now in the armed services.

HOUSING PANEL: Seeking authorization from the National Housing Agency for the construction of additional housing units near plants for aircraft workers' families.

CHILD CARE PANEL: Making efforts to cut down absenteeism and terminations of working mothers by providing nurseries and other child care centers for the children of these women.

Airplane plants today are producing more planes with fewer workers, due mainly to efficient production methods and labor utilization.

For instance, plane production in Council companies increased 4,260 per cent by weight from January, 1940, to August, 1943, with only a 933 per cent increase in total personnel. And despite a net gain of only 5.84 per cent in employment in the first eight months of 1943, the companies somehow managed to increase production 41.40 per cent.

But military demands for the production of warplanes for the combined Allied offensives planned this year are so great —a 28 per cent increase in the output has been asked of all companies—that production experts are doubtful of meeting the requirements unless Turnover is curbed.

Already, production engineers are devising new methods to speed output, which will aid toward meeting the increased schedules. But a lot more actual workers are needed, too.

It will take 30,000 more if those now on the job stay on the job, but it will require an estimated 115,000 more persons if the present rate of Turnover continues.

So all big guns of the aircraft production and personnel men are now sighted on one ominous objective—the capital "T" in Turnover! END

THIS BUBBLE HELPED
SINK A WARSHIP!

"Bombs released"...and another warship explodes from a direct hit.

A bubble helped in this deadly assault. For the "bubble test" helps perfect the Skylark Motor Mount which locks the vital, roaring engine of this hurtling demon in a web of steel tubing.

At Skylark each motor mount is painstakingly built. Tests for perfection are many and exacting. One is to submerge each motor mount, made air-tight, in a huge water-tank. The slightest air-bubble discloses a weakness that otherwise might cost lives.

With motor mounts, bomb racks, control systems, Skylark's craftsmen are helping American Air-Borne Craft to Victory today... tomorrow. You are sincerely asked to seek aid from Skylark on problems of aircraft parts construction.

SKYLARK
AIRPLANE PARTS
CRAFTSMEN
SINCE 1934
Skylark Manufacturing Company
Venice, California

## Army Air Forces Report

(*Continued from page 57*)

aviation engineers constructed airfields behind the front lines and pressed the attack.

When the United States forces first landed in North Africa there were nine airdromes that our planes could use. Within a few months there were a hundred. Mud, and later dust, were the worst problems. With the Axis on the run, airfields were built even faster. One request was received to build several fields in the Sbeitla sector; 72 hours later all were in use.

The portable steel landing mat, used in all theaters, has been one of the outstanding developments of the war. After experimentation with other types, our Allies now use the pierced steel plank type of landing mat developed in America. Today's production is concentrated on this type mat. To date approximately 175,000,000 square feet of the pierced steel type mat has been sent to the combat theaters, and 300,000,000 square feet is on order for the calendar year of 1944. Some conception of the logistics problems of modern war can be gained from the fact that some 60,000 pierced steel sheets 15 inches by 10 feet are required for a 150 by 5,000 feet runway, weighing nearly 2,000 tons, required 35,000 cubic feet of cargo space to be shipped overseas perhaps ten or twelve thousand miles. However, portable steel landing mats have proved to be worth many times their cost.

Weather is a critical factor in this war. The expansion of the Army Air Forces necessitated a corresponding increase in the weather service to fill the basic need for operational weather information. This has been done, and today the Army Air Forces Weather Service has units in every theater and along the air routes linking them to the United States. Personnel working on the Air Weather Service has increased 9,000 per cent.

This world-wide service, manned by thoroughly trained personnel, still did not completely fill our needs. Special climatic studies, based on historical records, permitted the selection by comparison of the best and worst periods of the year for a particular military operation. After selection of the proper season, it was necessary to wait until within 24 to 48 hours of "D" day before actually determining the weather possibility of a successful mission. The gap existing between climatic studies and short-range weather predictions had to be filled. Our only answer was in long-range forecasting—a determination of future weather well in advance of the mission planned.

Some conception of the size of the Army Air Forces may be gained from the recent statement of Robert A. Lovett, Assistant Secretary of War for Air, that over one-half of the Army's entire production in 1944 will be aircraft and its equipment.

During January, 1942, the number of aircraft produced in this country totalled 2,972. In January, 1943, the total had risen to 5,013. In September, 1943, the total reached 7,598. Even more interesting, however, is the September, 1943, total of 7,598 as compared with 117 for September, 1939, when the war started. During November, 1943, approximately 8,800 planes were produced. At the same time that these gains in numbers were made, greater gains had been made in the size of the planes produced and in their quality as fighting weapons. Weight is a better gauge of production growth than numbers. Production of airplanes, measured on a weight basis, has increased more rapidly during the past half year than during 1942.

It can now be announced that up to October 1, 1943, a total of 26,900 planes have been exported to our Allies by lend-lease or direct purchase. These aircraft are being flown over Europe from the United Kingdom, Africa, Italy, the Middle East and the Mediterranean area by British, French, Polish, Czech, Norwegian and other airmen. In the Far East, aircraft produced in the U. S. are being flown in combat by Chinese, British, Australian, and New Zealand airmen. On the front from the Baltic to the Black Sea, U. S. S. R. pilots have operated our aircraft as well as their own against the common enemy.

One hundred and forty-five thousand planes are scheduled for completion by the War Production Board in the next 15 months. They will be heavier and more elaborately equipped. The average airframe weight of airplanes being produced now is twice as great as it was a year ago. The weight of heavy bombers to be produced in the next 18 months is scheduled to exceed that of all types of planes produced in our first year and a half of war.

Not one of our Air Forces has the planes it should have. Every one could use double the number it now possesses. The Salerno beachhead was one of the turning points of the war, and we had just enough aircraft to cover our landing forces. The biggest battles in the air and on land are yet to be fought. We will need every plane we can produce.

At Wright Field, Dayton, O., the Army Air Forces have thousands of engineers and specialists who spend all their time groping, creating, studying to attain and maintain aircraft superior to those of our enemies. Wright Field designs, develops, tests new planes, engines and equipment, and supervises their procurement and production. It also tests enemy planes: German Messerschmitts, Junkers, Jap Zeros, Italian Macchis, and thousands of pieces of enemy equipment are evaluated.

(*Continued on page 102*)

"My new landing gear will enable planes to land even in trees!"

# . . . YOUR 4TH WAR LOAN QUOTA

WHETHER your plant meets its quota, or fails, lies largely in *your* hands. Your leadership can put it over—but if you haven't already got a smooth running, hard hitting War Loan Organization at work in your plant, there's not a minute to lose.

Take over the active direction of this drive to meet *—and break*—your plant's quota. And see to it that every one of your associates, from plant superintendent to foreman, goes all-out for Victory!

To meet your plant's quota means that you'll have to hold your present Pay-Roll Deduction Plan payments at their all-time high—plus such additional amounts as your local War Finance Committee has assigned to you. In most cases this will mean the sale of *at least* one $100 bond per worker. It means having a fast-cracking sales organization, geared to reach personally and effectively every individual in your plant. And it means hammering right along until you've reached a 100% record in those *extra* $100 —or better—bonds!

And while you're at it, now's a good time to check those special cases—*growing more numerous every day*—where increased *family* incomes make possible, *and imperative,* far greater than usual investment through your plant's Pay-Roll Deduction Plan. Indeed, so common are the cases of two, three, or even more, wage-earners in a single family, that you'll do well to forget having ever heard of '10%' as a reasonable investment. Why, for thousands of these 'multiple-income' families 10% or 15% represents but a paltry fraction of an investment which should be running at 25%, 50%, or more!

After the way you've gone at your wartime *production* quotas—and topped them every time—you're certainly not going to let anything stand in the way of your plant's breaking its quota for the 4th War Loan! Particularly since all you are being asked to do is to sell your own people the finest investment in the world—*their own share in Victory!*

**LET'S ALL BACK THE ATTACK!**

*This space contributed to Victory by*

**ZIFF-DAVIS PUBLISHING COMPANY**

*This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council.*

*Your Dollars Are Power, Too!*
*Buy War Bonds*

# POWER TO WIN

**Every month, thousands of Continental Red Seal Engines join the many thousands already doing service on land, in the air and on the seas.**

**One outstanding achievement of Red Seal Engines is to power 49½ per cent of all medium tanks. However, this is only one of many Red Seal activities, which include the powering of light tanks, trainer and liaison planes, farm and industrial tractors, landing boats, picket boats, amphibian tanks, trucks, concrete spreaders, hoists, pumps and much additional war-winning equipment.**

**With justifiable pride, it can be positively stated that Continental Red Seal Engines are doing much to swing the balance of power to victory — and peace.**

ARMY E NAVY

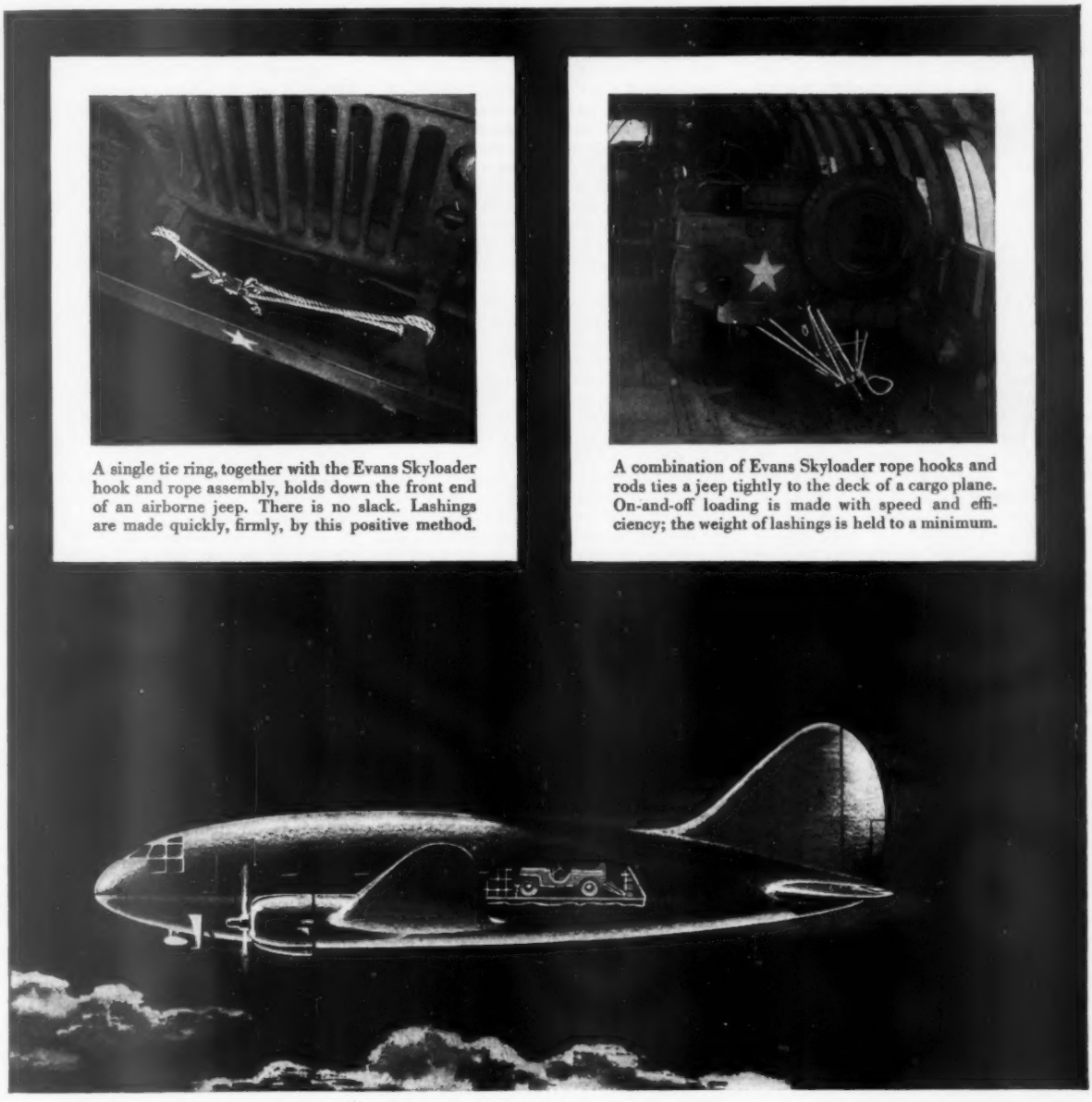
**Awarded to the Detroit and Muskegon Plants of Continental Motors Corporation for High Achievement.**

*Continental Motors Corporation*
*Aircraft Engine Division*
MUSKEGON, MICHIGAN

A single tie ring, together with the Evans Skyloader hook and rope assembly, holds down the front end of an airborne jeep. There is no slack. Lashings are made quickly, firmly, by this positive method.



A combination of Evans Skyloader rope hooks and rods ties a jeep tightly to the deck of a cargo plane. On-and-off loading is made with speed and efficiency; the weight of lashings is held to a minimum.



## *when the jeep takes wings*

In this war of speed everything takes to the air—troops, supplies, armament . . . even the jeep, tough little "pursuit ship of the infantry", has taken wings.

Stowing the varied and important cargo of war, seeing that it is quickly loaded and sped safely through all kinds of weather is a big job!

Evans Skyloader method is helping solve air freight problems by offering a simple, practical, positive system of tying down all types of cargo, removing all slack from the load and greatly reducing the weight of cargo lashings. Freight becomes part of the airplane!

Skyloader equipment is of two types: Metal tie-down rods with locking hardwood beams for heavy cargo; rope hooks and tighteners for the speedy handling of lighter freight in a wide variety of shapes and sizes.

We invite you to refer your special air cargo problems to Evans engineers.

★ ★ ★

*Vision to Anticipate the Needs of Tomorrow*
*Creates New Industries Today*

E. A. Evans
PRESIDENT

**EVANS PRODUCTS COMPANY**
**DETROIT**

***Evans War Products:*** Machine Gun Mounts • Tank and Automotive Heating and Ventilating Equipment • Evanair Water Heaters • Aircraft Engine Mounts • Airplane Landing Gear Beams • Battery Separators • Prefabricated Houses • Plywood • Skyloader • Utility Loader • Auto Loader • Auto-Railer • Auto-Stop • Stampings • Evanair Domestic Heating Equipment

(*Continued from page 98*)

Some of the more recent developments of public interest are dual-rotating propellers which offset torque, six-bladed propellers, higher horsepower motors, amazing navigational instruments, new types of disposable fuel tanks and the like. Wright Field made valuable advances in night color photography and in methods of detecting enemy camouflage.

December 7, 1941, (December 8, Hawaiian time) found the Army Air Forces equipped with plans but not with planes. When the Japanese struck, our combat aircraft strength was little better than a corporal's guard of some 3,000 planes; of these only 1,157 were actually suited to combat service.

We had 159 four-engined bombers. At the various bases outside of the United States, we had only 61 heavy, 157 medium and 59 light bombers, plus 636 fighters—a total of 913 combat planes. These were apportioned among Alaska, Hawaii, the Philippines, Puerto Rico, Panama, Trinidad, Newfoundland, Iceland, Greenland, The Virgin Islands, British Guiana and the Windward Islands.

Of our total 1,157 combat planes, 526 were strategically located to meet possible attacks on the Hawaiian and Philippine Islands. Within a few hours that number was reduced to 176.

On Luzon, it must be said, we had maintained an air alert since November 15. Even so, General MacArthur reported that at the end of the first day of war there were only 17 heavy bombers and approximately 70 fighters left out of a force of 35 *Fortresses*, 30 medium and eight light bombers, 220 fighters and 23 other airplanes. In the days that followed, 14 of the *Fortresses* managed to get to Australia, but the fighters were destroyed one after the other.

Our last two worn-out *Warhawks* sank a couple of Japanese ships with 500-pound bombs that had been hitched to the wings. This was the origin of our fighter-bombers.

In January, 10 of the 14 *Fortresses* plus 38 other heavy bombers, flanked by a few *Dauntlesses* and *Warhawks*, were used in Java with the then prevailing 10-to-1 odds against them. They supplemented the Dutch, Australian and British strength in another doomed attempt to stop the relentless Japanese push to the south. They gave a good account of themselves in the Battle of Macassar Strait. On the day before the surviving 14 bombers left for Australia (the first week of March) they flew 10 missions, sinking five enemy ships and damaging four others. But not by the most sanguine stretch of the imagination could they be called an Air Force.

Those same 14 bombers formed the nucleus of our 5th Air Force. The 5th is now one of 15. The Army Air Forces which the Axis calculated would be the weak link in our chain of battle, has instead turned out to be our greatest strength and has so far supplied our margin of victory.

We have proved that our pre-war plane designs and pre-war concepts of air strategy and tactics were sound. From the wreckage of a score of airfields scattered in the Pacific area rose an air force of 2,385,000 officers and enlisted men—a number still growing. As of October 31, 1943, those men have already flown over a quarter of a million combat sorties, expended in combat more than 40,000,000 rounds of ammunition, used up nearly 2,000,000,000 gallons of gasoline, destroyed in aerial combat 8,478 enemy airplanes, probably destroyed 2,555 more and damaged another 2,834. These figures do not include enemy planes destroyed on the ground nor the extraordinary score run up by the American Volunteer Group in China.

Offense is the essence of air power. This principle of modern war was amply demonstrated in the Coral Sea and Midway actions of May and June respectively. In both engagements, Army Air Forces bombers, operating with Navy aircraft and surface ships, helped dramatically to confirm the long standing conviction of this country's air leaders — air power, properly deployed and employed, can stop a sea-borne force. In the Coral Sea 19 enemy ships were sunk or damaged. At Midway, American forces sank at least 10 vessels, including four aircraft carriers and two heavy cruisers. They damaged a number of other ships and destroyed an estimated 275 airplanes.

Although the opposing ships never came within sight of each other during the entire Battle of the Coral Sea, it was largely a Navy show. The efficacy of our land-based planes operating alone against a large naval force was finally proved in the Bismarck Sea 10 months later.

The crew of one of General Kenney's bombers spotted a large Japanese convoy heading toward New Guinea on March 1, 1943. Thus began the Battle of the Bismarck Sea. During the three days that followed, the crews of 162 Allied planes repeatedly attacked this convoy and its protective cover of land-based fighters.

Both tactically and strategically it was an outstanding operation. Besides the ships sunk, from 59 to 83 planes had been shot down and at least nine others damaged. The Army Air Forces lost one *Fortress* and three *Lightnings* in combat, and a *Mitchell* and a *Beaufighter* through other causes. Total Army Air Forces personnel losses came to 13 while the Japanese lost approximately 12,700 officers and men. Entirely unassisted, the 5th Air Force, besides disposing of large numbers of airmen and sailors, wiped out an entire division of troops.

All Japanese efforts to reinforce the Buna-Gona region were frustrated by our long-range heavy bombers. Our Troop Carrier Command flew a complete striking force—troops, equipment and food—into the area. In one air movement 3,600 troops were brought from Australia to Port Moresby, and 15,000 from Moresby over the high Owen Stanley Mountains to the air strips near Buna. These troops were not only transported but were supplied by air at a rate of more than 2,000,000 pounds a week. Construction equipment and steel mats and asphalt moved by the same route. A four-gun battery of 105-mm. howitzers was ferried over by a *Fortress*. Sick and wounded were evacuated on the way back. The entire operation proved to be of far-reaching tactical consequence.

Our bombers have begun to make their presence felt in China, although in that theater we have not yet assumed the offensive. Supply is our problem in China.

It may throw some light to consider this fact in terms of gasoline alone. In the round-trip over the hump between Assam and Kunming, the *Liberator Express* transports now in use can deliver four tons of 100-octane gasoline. To do so, the airplane must consume three and a half tons of the same precious commodity.

The crews of a heavy bombardment group in China must ferry over their own gasoline, bombs, replacement parts and everything else in their own *Liberators*. Before this bombardment group can go on one combat flight, it must make four trips over the hump.

The pilots who fly our transports are as exposed as any in actual combat. Seventeen thousand-foot muntains have to be cleared by instrument flying; if our men veer over to the north they meet 22,000-foot peaks while to the south they drift over Japanese-held Burma.

That is the route our supplies must travel *after* they have already been shipped more than 10,000 miles—supplies not only for our 14th Air Force but to help equip the Chinese Army and to build and defend China's aidromes.

And yet the 14th Air Force is in the skies over China. Under the command of a master tactician, Maj. Gen. Claire L. Chennault, American flyers of the 14th from February 2, 1942, to October 31, 1943, have brought down 351 Japanese aircraft with a loss to themselves of only 68, an unrivaled record. That is not counting enemy aircraft probably destroyed or damaged.

The Italians, oddly enough, taught us a fine lesson in Africa as far back as the summer of 1940. They started the Libyan operations of that year with a large, powerful and modern air force. This weapon, which might well have won the campaign for them, was under the direct command of the Italian Ground Forces. Local army commanders wasted air power in penny packets to protect their own sectors or to help advance small detachments. The Royal Air Force, consisting of a handful of obsolete aircraft but employed in concentrated mass as a true air force should be, completely destroyed some 1,100 Italian planes.

Many of our present ideas about the Tactical Air Force were evolved in the heat of these desert campaigns. There is no doubt but that experience and new conditions modify many of our notions but the present concept of the Tactical Air Force can be regarded as tried and proved in North Africa, Italy and New Guinea.

The Tactical Air Force works in partnership with all the other components of air power. In North Africa it worked with the Strategical Air Force which concentrates on long-range destruction of targets like munitions establishments and supply ports; it worked also with the

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THE CHOICE OF BETTER MECHANICS

Coastal Air Force whose functions consisted of cutting the enemy's sea-borne supply route and of protecting our own. The Tactical Air Force is also intimately concerned with the battlefield itself.

It is misleading to say merely that the Tactical Air Force provides support to the ground troops. The word "support" always makes people think of air power as an ancillary weapon of the Army or the Navy in a land or sea operation—as long-range artillery directed by subordinate ground commanders. This narrow conception appears to be firmly imbedded in the public mind as well as in the thinking of the inexperienced soldier subjected to his first enemy strafing. Fortunately for us, it was a conception shared also by highly experienced Axis strategists.

Air support was found more than adequate by the Germans in their blitz through France where their domination of the skies was all but unchallanged. Both Germans and Italians found another state of affairs in North Africa. There they were first knocked out of the air and then left with the choice of being driven into the sea or surrendering. Our combined air forces and navies saw to it that no Dunkirk took place.

The Royal Air Force and the Army Air Force functioned as a unit in Africa.

The battle for the capture of German forces in Tunisia began not on April 22, when the ground forces pushed off, but four days before when we sent 90 night bombers against the German airdromes. We had guaranteed to reduce the Luftwaffe to relative impotence by the dawn of the 22nd, and we did. In two days we destroyed 112 German airplanes.

The precision and effectiveness of our bombing became dramatically evident as our ground forces moved into Ferryville, Bizerte and Tunis. The entire town and port of Bizerte had been filled with German establishments, and our planes went into attack with the intention of blotting it off the map. Gen. Laurence S. Kuter's automobile entered the town on May 9 and he drove around for over an hour without coming across a single inhabitant. In that time, he could not find a single building, however small, that had been left unscathed.

Ferryville, on the other hand, had been heavily populated with refugees. When our first troops came through, no evidence whatever of war could be discerned. Ferryville's waterfront area, however, was a twisted shambles of steel, broken concrete and sunken ships. Similarly, the residential and business sections of Tunis remained intact, but its military installations had been reduced to debris.

With the date of our landing at Salerno set, our air force swept forward with its full power. Our first objective was to disrupt the enemy's flow of supplies and reinforcements, and to isolate German divisions by dislocating the entire rail and communications system. To this end, we raked Italy from the toe to the Brenner Pass, flying 4,419 sorties and dropping 6,230 tons of bombs between August 17 and September 6. The damage we inflicted on key railroad junctions, rolling stock and repair facilities is still crippling Nazi resistance on the peninsula. In the first phase we also concentrated on destroying airdromes as well as aircraft in the air and on the ground.

From September 9 to September 11, we set about isolating the battle area. In this phase we flew 1,006 sorties and dropped 1,679 tons of bombs, achieving virtually complete interruption of traffic on the main lines leading to the contested region.

On September 12, our Strategic Air Force joined the operations. On the next day, nearly all our bombers flew two sorties apiece. By September 14, whole towns in the area had been obliterated, motor transport concentrations smashed, and severe casualties inflicted on enemy troops. In those four days we flew 2,407 sorties and dropped 3,122 tons of bombs.

On the morning of September 13, the commanders of our air-borne troops were notified that air reinforcements were required by the United States Fifth Army with 24 hours. At 2045 hours on the same day, pathfinder units of the air-borne task force took off from their Sicilian base, reaching the drop zone prepared by the Fifth Army on the Salerno beachhead at 2314. Twenty-five minutes later the first elements of the paratroopers arrived. In one and one-half hours 90 aircraft dropped 1,300 paratroopers and equipment in an area approximately 1,200 x 800 yards. By 0200 hours, September 14, these paratroopers were completely organized and marching into position on the front line. Many of the units had had less than two hours to give their planes a final servicing, arrange take-off plans and to load men and equipment.

On September 14, the operation was repeated, this time with 131 *Skytrains* dropping 1,900 paratroopers in the same zone [an average of 14.5 per plane] while 40 *Skytrains* carried a battalion of infantry and a company of engineers to a zone five miles southeast of Avellino, behind the enemy lines. Just 24 hours after completing these three jobs without a fatality, the troop carriers were back at work, flying in essential supplies to the Fifth Army and evacuating wounded.

During one year's operations (from November 8, 1942, through November 7, 1943) in the Mediterranean Theater, Allied aircraft of the Northwest African Air Forces dropped 92,233 tons of bombs on enemy installations and supply routes. Of this total 65,377 were dropped by the AAF. We hit targets in Austria, Jugoslavia, Greece, Albania and France as well as in North Africa and Italy.

In this theater we destroyed in aerial combat and on the ground 5,511 enemy aircraft, probably destroyed 750 and damaged 1,903. Of the total destroyed it is estimated that 4,100 were German, the rest Italian. Aircraft found abandoned in enemy territory including Tunisia, Pantelleria, Sicily, Italy and Corsica total 3,491; of these 1,986 were German and 1,505 Italian. Complete reports on Sardinia have not been received at this writing. An additional 231 aircraft were found at the Castel Benito airdrome, near Tripoli, but these are excluded from the above totals because they had previously been reported by the Middle East Command.

During the same year, ended November 7, 1943, the Northwest African Air Forces sank a total of 185 merchant ships, totalling 173,400 tons; probably sank 110 ships, totalling 187,000 tons; and damaged another 243, totalling 373,700 tons.

In the meantime, the Malta, Middle East and Ninth U. S. Air Forces accounted for at least another 2,500 enemy aircraft, and dropped at least 45,000 tons of bombs.

Our strategic air plan is predicated on the fundamental fact that our bombers can fly deep into enemy territory, drop an effective load of bombs, and return to base without losses disproportionate to the damage accomplished. We have proved that we can do this.

Our first step in the strategic bombing offensive is the destruction of the enemy's fighter strength. This is the logical operation to be carried out while we are developing our bases and building up our bomber fleet. It is a course dictated not only by logic but by the prime necessity of protecting our own aircraft.

Fighter strength can be knocked out on the ground, in air combat or in the various stages before it rolls off the production line. We know that the nearer to the final assembly stage we attack enemy aircraft, the less time he will have to replenish his front line strength. Conversely, the farther away from the assembly stage his fighter aircraft industry is bombed, the more time he will have to take remedial steps.

For quick results, we take out the assembly plants, but for some of the more lasting effects we concentrate on a system of targets deeper in the industry. The destruction of a plant making steel for airplanes is felt in a matter of weeks while the destruction of a coal mine does not affect the industry for months.

The next objective of our bomber offensive is the smashing of industrial targets vital to the enemy's military strength on the ground.

No bombing mission can be regarded as single, self-contained operation. Each mission is thoroughly planned, with long-range objectives in view. Probabilities of error and minimum resultants are considered. Our strategy is based on a blueprint of scientifically calculated attrition.

When our heavy bombers led by the [then] Commanding General of our 8th Air Force, Ira C. Eaker, attacked the railroad yards at Rouen on August 17, 1942—that could be called a raid. But assaults such as the ones on the Renault works, Huls, Ploesti, Heroya, Regensburg, Marienburg, Schweinfurt or Wilhelmsshaven were major battles that had to be planned as such. The effects of some of our four-hour operations are felt a great deal more keenly than a long drawn out ground struggle for a particular locality.

In some of these major battles, our losses have been negligible. In our attack on the Focke-Wulf assembly plant at Marienburg in East Prussia (October

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☐ Women's Instrument Technician

9, 1943), only two out of 100 *Fortresses* were lost. The concentration of bomb bursts on this target was so great that there is sound reason to evaluate this as one of the finest examples of precision bombing to date. The attack was made in daylight from altitudes between 11,000 and 13,500 feet. Several hundred 500-lb. G. P. bombs and 1,300 100-lb. incendiaries were dropped. Study of reconnaissance photographs has convinced photo interpreters in the United Kingdom that *every* factory building and *all* the hangars had been damaged. And this plant had been turning out about one-half (110 per month) of all of Germany's Fw-190 fighters.

It stands to reason that not all our attacks should be so successful. At Stuttgart (September 6, 1943) we lost 45 out of 338 *Fortresses* (over 13 per cent), destroying 84 enemy aircraft, with 30 probables and 25 damaged. The bombing itself had poor results. Heavy clouds obscured the primary objective, and it was necessary for our bombers to select secondary targets and even targets of opportunity. Forty-five *Flying Fortresses*, fully crewed, are a big price to pay.

The equipment of our escort fighter aircraft with extra long-range disposable fuel tanks now enables them to give our bombers continuous cover to and from targets formerly out of tactical range. Another factor of great importance is the development of navigational aids so accurate that enemy targets can now be attacked by bombing through the overcast or at night.

The general pattern of German reaction tc 8th Air Force operations shows a number of significant trends:

1. General unwillingness of fighter forces to join combat with invading aircraft other than heavy bomber formations.

2. Furious all-out attack, with little heed of fighter losses, on heavy bombers dispatched against key targets; this is true particularly when bomber formations are unescorted.

3. Increasing employment of fighters equipped with cannon of larger than 20-mm. caliber, and of fighters (in many cases twin-engined) firing long-range rocket projectiles.

These factors point definitely to:

1. The need of Germany to conserve available fighter strength.

2. The effectiveness of our bombing which forces on the Luftwaffe the necessity of stopping such attacks at any cost.

3. A search for effective new weapons; in particular long-range weapons that permit attack from outside the lethal range of our formations' .50-caliber machine-gun defense.

In view of the high rate of attrition of German fighter aircraft on the western front, the near future appears likely to be a crucial period which may determine the survival or destruction of the Luftwaffe as an effective air force.

Nowhere in the world are the lives of men as interdependent as in a bomber on a mission. The pilot must be quick, daring, cautious. The gunners must draw a bead on shadows flashing past them at 600 m.p.h. The navigator has the plane in the palm of his hand from start to finish; every minute he strays off the course makes it 60 seconds less likely that he and his comrades will return. If the bombardier misses, the sortie has been pointless.

Heroes or not, our men have done heroic things. Privates, sergeants, generals have put their lives on the line—not without regard to consequences, as some like to think—but knowing full well what the odds were.

On the training fields of the United States other men are making another kind of sacrifice. Top flyers themselves, they have been wanting more than anything else to get into combat. Cadets whom they have taught to fly return home loaded with honors and higher than they in rank, perhaps. But every German or Japanese plane brought down is a tribute to the quality of their work. They are the instructors.

There are weather observers in lonely Aleutian outposts, communications men in a globe-circling network, Army engineers who built fighter strips where no human being had ever penetrated, Navy crews who brought in supplies under skies filled with Zeros—men who kept the Army Air Forces in the air as surely as any pilot.

Behind them and behind every man in uniform are the men and women who work in our aircraft factories, the farmers who raise their food, the miners who bring up the ore, the women who make parachutes, the 600,000 volunteers who acted as plane spotters until they could be released for other defense work.

But final tribute must be to the airmen who pit their flesh, skill and steel against the flesh, skill and steel of our enemies. It is they who are *fighting* this war. END

## Parachute Sense

(*Continued from page* 33)

you'll want to run through your proper recovery moves to make sure you can't bring your plane through before you leave it. Saving your aircraft is highly advisable if at all possible. But—nobody expects you to risk your life to save your plane. If you think you're too low to take another try after your first normal effort to apply control—*get out!*

And what's even more important is your mental process while you're making your fight for control. As you do the things you've been taught in order to check your dive, spin or other attitude you're in, make your plans for bailing out.

Even while you're applying the control pressures necessary, think, "If this doesn't work—I'm going over the side."

Make sure your cockpit hood is open, open it, or be ready to open it.

Make sure your safety belt will release immediately, but don't release it until you jump unless you're on an even keel and can stay that way.

Take a quick glance at your rip cord and make sure it's where you think it is.

Go through the mental process of clearing your plane so you know exactly what you're going to do.

And when you *know* you gotta go—*Go!!*

Don't stop to worry what anybody is going to say about your bailing out. He isn't up there in trouble. You are.

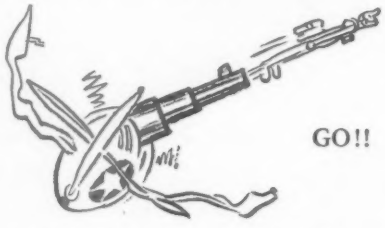
Don't ever change your mind about going unless you've regained control of your plane.

Don't start imagining things that can go wrong with your 'chute. When you pull the rip cord, it'll open.

Don't start thinking about your landing procedure—even if you're over water—until you're on the way down. You'll have plenty of time then, and it'll break the monotony.

Don't start wondering how it feels to sit down on the horns of a bull—he'll duck.

Don't do anything after you decide to go except one thing: *Go!*




A long, tender farewell may mark you as a kindly, sensitive human being when you're saying good-bye to your girl(s). It will mark you as a blithering idiot if you employ it when you're leaving your plane. Even a fast pat on the cylinder head is no good. You have to be as rude as a Nazi and as ruthless as two Japs. Up and over—that's your technique—with only one glance behind after you're over to make sure you're clear when you pull the ripcord.

From an open cockpit, the headlong dive is the best way of leaving your plane. The reason is that it provides the simplest method for clearing your aircraft and you avoid being struck by the tail assembly. It gets your head and shoulders down out of the way first; it's the easiest way to get out; and it takes the least time. All of which points are desirable. Highly.

If you go out of your aircraft backwards, or dive with your knees drawn up, you will somersault. This is to be avoided, so keep your legs straight if you can, or straighten them as soon as you're clear and before you pull the ripcord.

Somersaulting may be great fun, and may make you feel young again, but it also means that when you pull the rip cord the lift webs will undoubtedly come up between your knees, and you'll

(*Continued on page* 116)

OFFICIAL U. S. NAVY PHOTOGRAPH

He's off Jap hunting on a round trip ticket. Odds are five to one (and better) that the Jap will come out second best. But as the fortunes of war are fickle and airplanes are expendable, that moment may come when any American pilot must step out into space. In that split second of man's last chance his return trip ticket is his chute.

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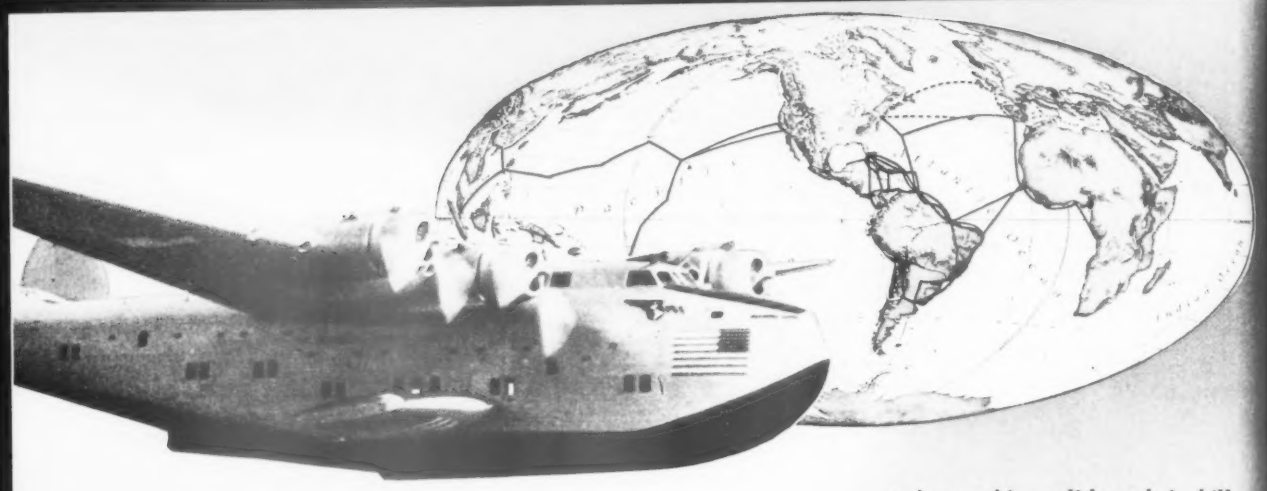

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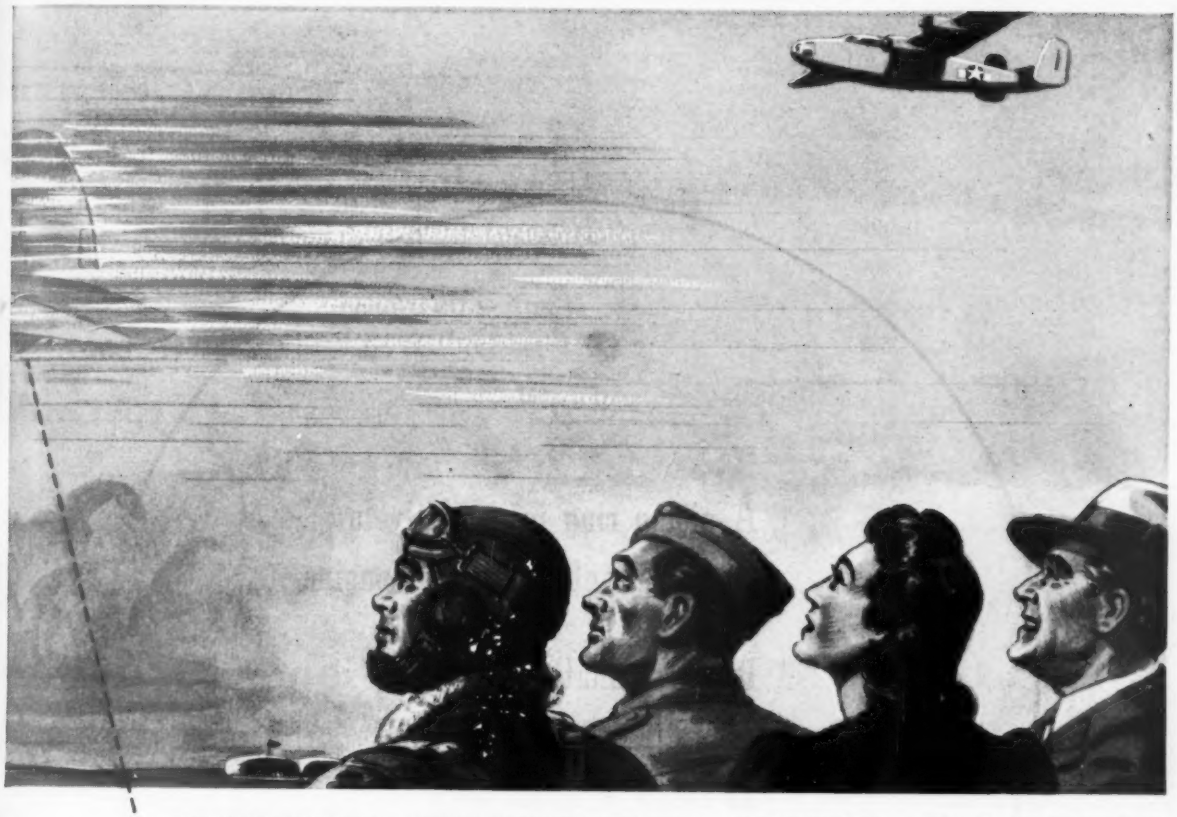

# THEIR FUTURE JUST PASSED

Many of the men and women *who are waiting for the war's end* to take their *first step* in flying as a career may find they are too late. The following air-minded Americans will be ahead of those who hesitate:

*Military pilots*—those who do not return to other lines of work. Many are now training at one of the Anderson Air Activities fields, cooperating under contract to the U.S. Army Air Corps.

*Civilians who qualify* for wartime training, leading to positions as civilian instructors or Ferry Command Service pilots—both men and women.

*Civilians, who are getting in line for post-war employment* by training now in one of the expanded Anderson Air Activities schools.

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While all activities in the Anderson organization are dominated by the urgency of war, future plans include: *Continuation of flight and ground school instruction—Re-establishment of sales and service for planes, parts and accessories.*

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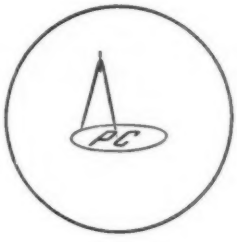


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(*Continued from page* 106)

make your descent upside down and with a certain amount of pain. A British pamphlet says: "a very good view of the ground is at once obtained but the position is extremely uncomfortable, definitely undignified, and you may even lose things out of your pockets."

If one of those things in your pockets happens to be your address book, you'll bewilder the farmer who picks it up and also leave yourself with nothing to do at night but go to the movies. That's hard on your eyes.

So get your legs out straight before you pull the rip cord, and come on down right—this is no time for experimenting.

Perhaps this is a good place to stop and explain that the procedures outlined, unless otherwise stated, visualize the plane in level or almost level flight at the time of bailing out. The only important variations are as follows: If the plane is in a spin, the jump should be toward the inside of the spin—if you are spinning to the right, go over the right side; if you are spinning to the left, you go over the left side.

If your plane is in a steep dive, remember that the second you unfasten your safety belt you will be thrown forward—so make certain your feet are well braced when you release the catch.

Also, whenever you dive over, dive slightly forward and down if you can, as the tail surfaces are not far behind you, and you want to be sure you clear them. Keep that forward movement slight, though—you want to get down at as steep an angle as possible.

If your wings are in a direct line to port and starboard of your cockpit, your safest method is to dive right out on the wing itself and slide head first off the trailing edge.

If you are in full control of your plane, and are bailing out due to fire, weather, fuel exhaustion, etc., the best way to get out is to invert your plane, release your safety belt and fall out.

In no case stand up in the cockpit and pull your rip cord, relying on the 'chute to whip you off into space. The odds are very high that your 'chute will foul the tail surfaces. You must be free and clear of the plane when your 'chute opens and the headlong dive is the best method of insuring that!

Your attachment to your plane is undoubtedly deep-rooted. You probably love it dearly. However, you don't want any kind of attachment to impede your progress when you're taking leave of it—so make sure there isn't any. Your head phone should be disconnected, and your oxygen tube should also be detached as the very first moves you make. If you are jumping from a high altitude, and want to fill yourself as full of oxygen as you can before jumping, disconnect your oxygen tube as the last thing before going over the side.

And that's about all there is to getting out of your plane. Invert and fall out or dive out! Whatever you do, do it fast, but do it calmly, keeping your mind on the various steps as you come to them. Use your head, obey a few simple rules, and you'll have no trouble.

The $64 question is too easy—but is it? This question is: What is the first movement you make after you go over the side of your aircraft in an emergency exit? You would answer—and loudly—"Pull—that—rip—cord!"

And you would be wrong—and no money for you!

The first thing you do is make absolutely sure you're clear of your aircraft. And although this may come as a shock, the best way to insure that (in addition to leaving your plane correctly) is to look for the plane. This is done by the conventional movement of turning the head and opening the eyes—if you have closed them—or just turning the head if your eyes are already open, which they should be. If you keep your goggles on you will experience no difficulty. You can raise them during descent to give yourself an unobstructed horizon and select your most suitable landing place.

Another reason for keeping your goggles on is that leaving your aircraft at high speed means that you are travelling forward at high speed yourself for a brief period after you leave the plane. You know what it means to try to see without goggles under these circumstances. When this forward speed has stopped and you are falling vertically, the rush of air won't bother you unless you happen to be exactly face downward. In any other position your body and clothing break up the air current and form a shield.

If you are over 600 feet don't pull your rip cord until your fall is vertical—and under 600 feet give yourself as much margin as is practical.

The shock of your 'chute opening while you're hurtling along horizontally is considerably increased and could result in damage to the 'chute itself. It could also be ripped off you.

"Like lying on a feather bed" is the way experienced jumpers describe the

sensation of falling before the rip cord is pulled. Contrary to most belief, there is no actual sensation of "falling" at all. The reason for that is that your body builds up a cushion of air underneath it. Movement of your limbs is unimpaired—and straightening your legs will keep you from any somersaulting or spinning that would add to your difficulty in functioning normally.

So—when you are sure you are clear and equally sure you are not rolled up in a ball with your knees up near your chest some place, and when your horizontal movement has stopped or nearly stopped—grasp that handle and give it a good, sharp, strong jerk. Your 'chute will open in about two seconds.

If above 600 feet altitude don't jump with your hand on the rip cord handle. You may accidently pull it before you're out of or clear of the plane—and those tail surfaces are not kind to either your shroud lines or canopy if they foul!

But if you're below 600 feet you have no time to waste. Be extremely careful of premature openings and jump with your hand on the rip cord handle.

In the conventional, seat pack type 'chute you normally will be wearing, the handle is on the left side. It's easy to get at and easy to pull. If you want to jump with your hand somewhere near it, keep your right arm close to and across your midriff, with your hand about six inches from the handle.

Look *for* and *at* the handle when you reach for it. Don't rely on your memory or sense of touch alone.

The main reason for that is that at some points in your flying career you may wear a chest pack or other type 'chute, with the handle on the *opposite* side, and you don't want to reach automatically and find you're grabbing nothing but your own floating rib.

During the next two or three seconds (it only *seems* like two or three weeks!) while you're waiting for the 'chute to open, do just that: wait for it to open. It will.

(*Continued on page* 120)

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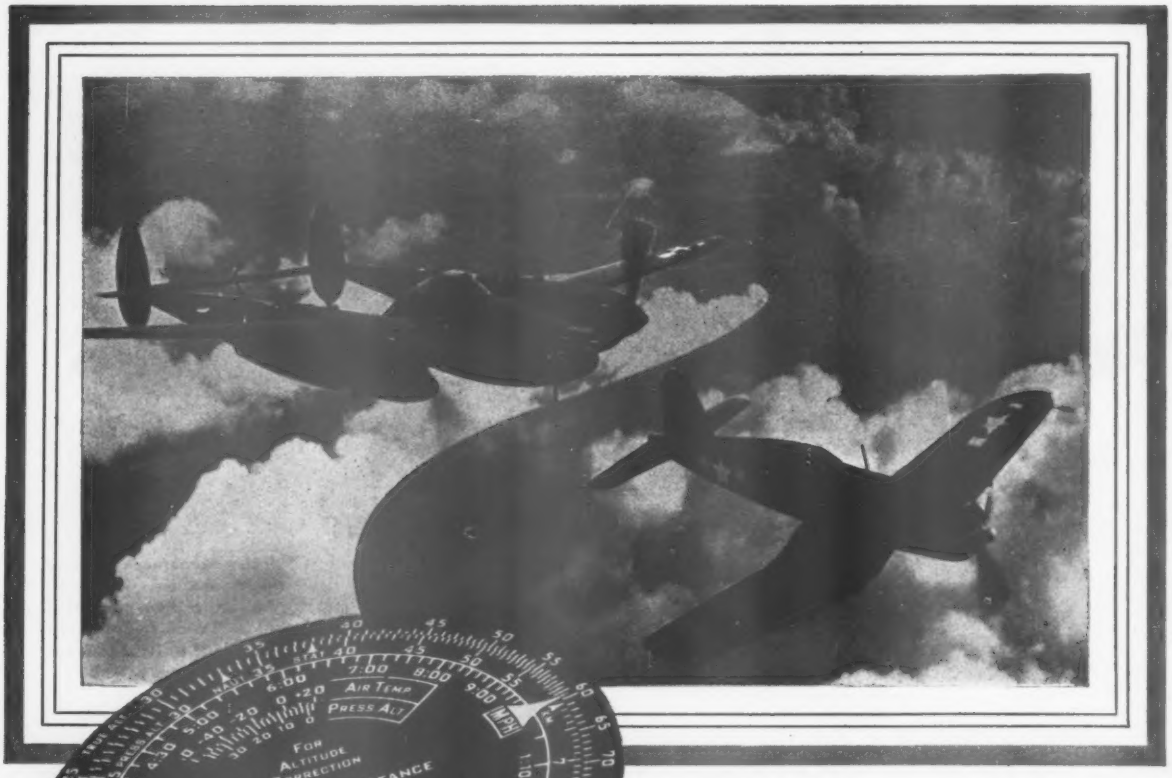

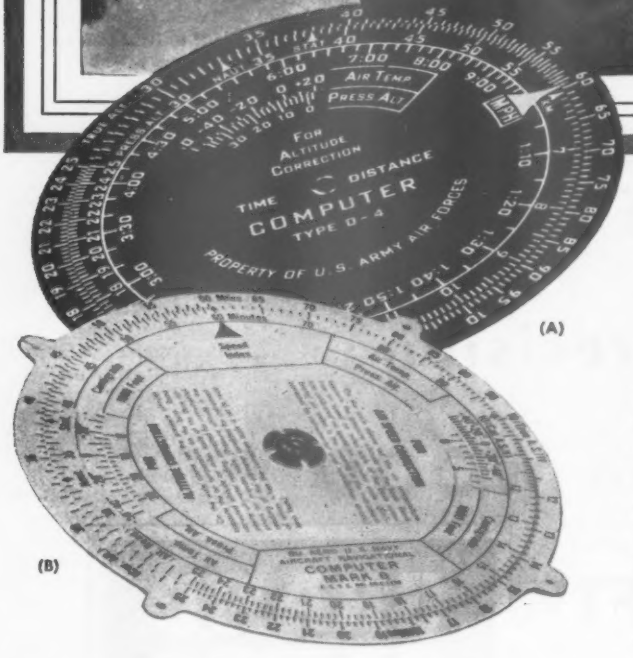


*(A) Army Type D-4 Computer—Dull Black with Fluorescent Printing, $2.00*

*(B) Dalton Mark 8 Computer—Dull white with Black Printing, $1.00*

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(*Continued from page 116*)

In your pack is a "pilot 'chute," which measures roughly a yard across, and which operates on a spring mechanism. As soon as your rip cord is pulled this pilot 'chute pops out, and as it opens it pulls your main 'chute right out after it. This, of course, greatly reduces the length of time it takes your main 'chute to open—and saves you the proportionate number of gray hairs which collect while you're waiting.

When your 'chute opens, your downward progress is immediately checked. There is, however, a lot less shock involved than you would imagine. Don't forget that the construction of your harness and 'chute is not a matter of haphazard guess-work. Years of research, testing and experience are built into the gear and the present equipment is as nearly perfect as exact science can make it.

For instance: your 'chute is woven so that it is porous. When it snaps open it isn't a tightly woven, solid sheet of fabric that presents 100 per cent resistance to the air. It's constructed loosely enough so that the right quantity of air rushes up through it, and the downward speed of the 'chute (with you in it) slows more like an automobile when a brake is applied, than when it runs into a brick wall.

Believe it or not—your 'chute is now open and you can take stock of the situation. The first thing you'll notice is that you're uncomfortable. That's perfectly normal. Your position in your 'chute is the same as though you were sitting in a swing, and right after your 'chute opens your body is always too far forward for comfort. To get comfortable, place your thumbs on the seat straps beside each leg. Press downward, which pushes your body upward and farther back in the harness. Now you're all set. So far so good.

You're out of your plane, clear of it, you've pulled the rip cord, the canopy is open and you're sitting comfortably although without your pipe and a good book. Now what? Probably a certain amount of oscillation—swinging back and forth like a pendulum. This you will want to check, as careening back and forth is likely to cause nausea, accelerates your rate of fall (each swing spills air from under the side of the 'chute), and makes proper landing impossible and highly dangerous. Not only do you hit the ground harder, due to the more rapid descent of the 'chute, but two other things are likely; first, if you land while at the bottom of your swing you will be rushing over the ground as you touch; second, if you are not at the bottom of your swing, the swing itself will tend to slam you in, instead of lower you in.

Oscillation—swinging of the 'chute—is stopped by grasping the lines on the side of the 'chute which is tending to rise, and pulling them down about six inches. As the swing reverses, transfer your pull to the other side. You will experience little difficulty in stopping this swinging.

Look around now while you're on the way down and get the terrain in your mind. (If it's water, this presents no problem at all, as one wave is mighty like another. The technique for water landings is given later, anyway.) Make sure you know where the trees are, what your chances are of hitting a house or wires, what direction the nearest house will be after you're down, highways you want to avoid but close to which you want to land, and so forth. Naturally you get the general scene in mind as soon as possible, and refine your view and make your more detailed plan for landing as you drift lower and identifications become easier.

Smoke banners, agitation of tree foliage or bending of small trees or long grass, in addition to your own drift direction and speed should all combine to give you a fairly comfortable idea of where you will finally arrive and how fast you will be moving in relation to the ground when you touch. In other words, if you don't waste your time trying to remember the lyric of the leading tune on the Hit Parade, or the telephone number of some girl you know in the nearest city, by the time you arrive at your destination (the ground) you should be practically bursting with self-confidence. But you still have some things to do and some principles to remember.

You have control of your 'chute. Not 100 per cent control, naturally, but you *can* manage to have a lot to do with the selection of your final landing place. "Slipping" the 'chute is the way you assert yourself—and the method is simple.

If you want to slow your progress in the direction you're going, in order to land in a certain area or avoid a certain obstacle, reach high up and grasp the shroud lines on the side of the 'chute that corresponds to the direction toward which you want to move. Pull them down three or four feet. This spills air out of the opposite side of the canopy, and gives your 'chute a gliding "slipping" motion in the direction of the lowered side.

You can slip your 'chute by this method in any direction. But it is not possible to stretch your glide—so don't make *that* mistake.

Remember also that slipping accelerates your rate of descent during the maneuver—so don't slip your 'chute close to the ground, except in an emergency.

Remember that when you want to avoid an area or obstacle you should plan to land short of or to one side of it. Your increased rate of descent will probably cause you to undershoot it by a safe margin if you aim "this side" of it.

Always pull the shroud lines on the side toward which you want the 'chute to slip.

Keep your eyes upward, on the canopy, while you're slipping your 'chute. That's the best way to see what you're doing and avoid the possibility of collapsing your 'chute too far.

Slipping your 'chute and increasing your rate of descent is an excellent way to hasten your progress out of the way of an enemy flyer's guns—and to get yourself rapidly so close to the ground he can't follow you down. If he tries to, and flies right into the ground, that's just too bad, isn't it?

Your primary purpose in making your landing in a 'chute is not, of course, just to get on the ground. The law of gravity will take care of that in the normal course of events. Your object is to make that landing neatly and expertly—avoiding things like going through the side of a house and scaring the occupants half to death, or doing a triple somersault and winding up with two broken ankles or a broken neck. So land *facing* the direction of your drift.

On the standard type parachute, which we have been discussing right along, there are four points of suspension—two lift webs forward and two aft of your body. These will give you full control of the direction in which you want to face, for you can turn your body in any desired direction by pulling on two diagonally opposite lift webs.

That sounds complicated; it's really very simple.

Reach up with your right hand and grab the left after lift web overhead. Then with your left hand—also overhead—grab the right forward lift web. Pulling both webs toward the center rotates your body—and the amount of rotation naturally depends on how hard you pull. (You probably have done exactly the same thing as a child, when turning in a garden swing.)

That's all there is to that—except, of course, that you check your rotation when you're facing the direction of drift, and hold that position for your landing.

Stay in your sitting position with your knees normally bent as you touch the ground. And pull the lift webs down sharply as you touch. This will prevent going over on your head at the impact, and will also slow your last seconds of descent.

Make no other effort to maintain an upright position. If you now find you have a tendency to fall or roll, *relax and give.* You know enough by now to know why you should follow that advice and not stiffen to fight the impact. A relaxed, rolling fall can't hurt you.

You may have a drag with the C. O.—but you don't want one by your

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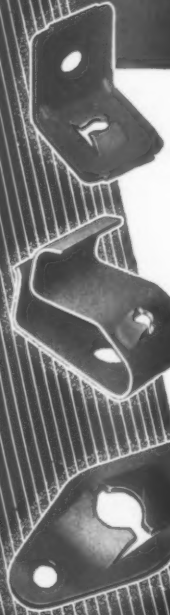

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canopy in a high wind. It isn't regulation—and it isn't comfortable. Under many conditions it isn't even safe.

Two methods of prevention are open to you: you can either collapse your 'chute immediately on hitting the ground, or you can adjust your harness so that you can slip out of it as soon as you've landed.

The best method of collapsing your 'chute before it rough rides you half way back to your base is as follows:

The canopy is either touching the ground with one edge, or is a couple of feet off. This means that the shroud lines connecting it to you are roughly parallel with the ground. Grabbing the bottom group of lines—those touching or nearest to the ground—and pulling, should collapse the 'chute with little or no trouble.

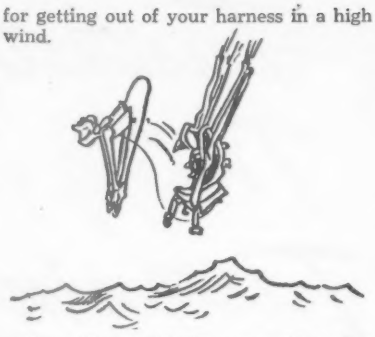
Getting out of harness is accomplished by preparing yourself for it before you land. Sit *well back* in the sling and unfasten the snap hook across your chest. Then unsnap the hooks of the leg straps *but do not remove your arms from the shoulder straps.* Reach up and grab the risers, and at the instant your feet touch the ground *but not before,* let go the risers, raise your arms up and back over your head, and slide off the seat formed by the swing in which you are, of course, sitting.

You're free, now, and in no danger of being dragged. You may, however, fall or roll—and probably will.

All of the procedures given thus far apply also to landing in water: the decision to go (which may vary, depending on the type ship you're flying); the bail out; pulling the rip cord; and the control of your 'chute during descent.

The landing doesn't give you much leeway.

The procedure to be followed is that given immediately above—the directions for getting out of your harness in a high wind.



You will probably have on a life jacket that must be inflated by you, or a pack type of small raft that must also be made buoyant. This raft will be in a container, which in turn is attached to the "D ring" of your life jacket by a light, one-inch webbing. This is done so that when you get out of your harness as soon as you touch the water, you won't find your 'chute is being blown surely and steadily away from you, carrying your raft with it!

Also attached to your life jacket will be a dye sea-marking device consisting of three ounces of fluorescein dye powder packed in a waterproof fabric container. This supplements the marker now provided for life rafts, and colors the water around you a yellow green, visible for eight miles at 5,000 feet altitude. Ripping off the tape on the bottom of the package, *after you are in the water with your jacket inflated,* releases the dye—which is visible for about *two hours.* Consequently, if a water landing takes place at night or under adverse weather conditions, don't release the dye the second you're comfortably riding the waves—wait until you *know* your dye will be of the most value to any searching crew.

So, water landings add up to thi Leave your 'chute as soon as your fe touch the water. Make sure your 'chut has drifted off to one side in the win before you operate the inflating mech anism or your jacket or raft and start t swim, so you will be sure not to get en tangled with the shroud lines.

Under no circumstances inflate eithe the jacket or raft until you are in th water and free of the 'chute. You harness is snapped over your jacket an it cannot inflate properly. If it doe inflate you will not be able to get you harness off.

Don't release your marking dye unt you're sure it will do the search cre some good. (The fish aren't interested.

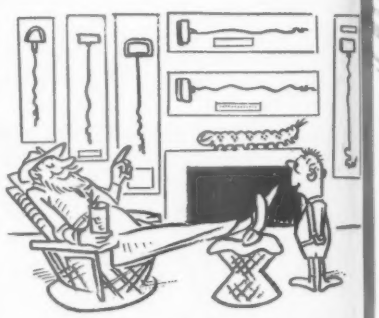
And with regard to the whole proce dure of making an emergency jump in 'chute remember this:

You have been given equipment tha works.

You can trust it.

You've been told how to use it.

Use it that way and you have an ex cellent chance to become—



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## Future Air Traffic Control

(*Continued from page* 70)

delphia-New York Airway was used, and in the Washington Control Area, a sector on the Philadelphia-Washington Airway. Figures 6 and 7 show instrument flight plan movements per peak hours in the selected sectors for the fiscal years 1941 and 1942, and the estimated rate for the peak hours of the years 1943 to 1950.

The graph in Figure 6 shows a progressively increasing traffic rate of from 18 instrument flight plan movements per peak hour in 1941, and 30 in 1942, to more than 200 movements per hour in 1950, for the busiest sector of the New York area.

The graph in Figure 7 shows a progressively increasing traffic rate of from 12 instrument flight plan movements per peak hour in 1941, and 25 in 1942, to more than 175 movements per hour in 1950, for the busiest sector of the Washington area.

The rates shown are for the busiest peak hours of each year, and, as previously mentioned, the average peaks throughout the year are approximately 60 to 75 per cent of these rates.

A brief study of traffic conditions at other centers reveals that they are also progressively growing. In fact, a survey shows that the traffic in the Cleveland Airway Traffic Control Area is practically as high as in the Washington Area. Eight of the other centers are less than three years, and at least eight more are less than six years, behind the figures shown for the New York area.

These estimates for future air traffic assume that there will be no restrictions, preventing *all* the traffic which wishes to move from doing so. This would not, of course, be realized if bottle-necks were created by providing insufficient facilities for the use of the air space, by failing to create sufficient airport capacity or by inefficient planning and control of movements.

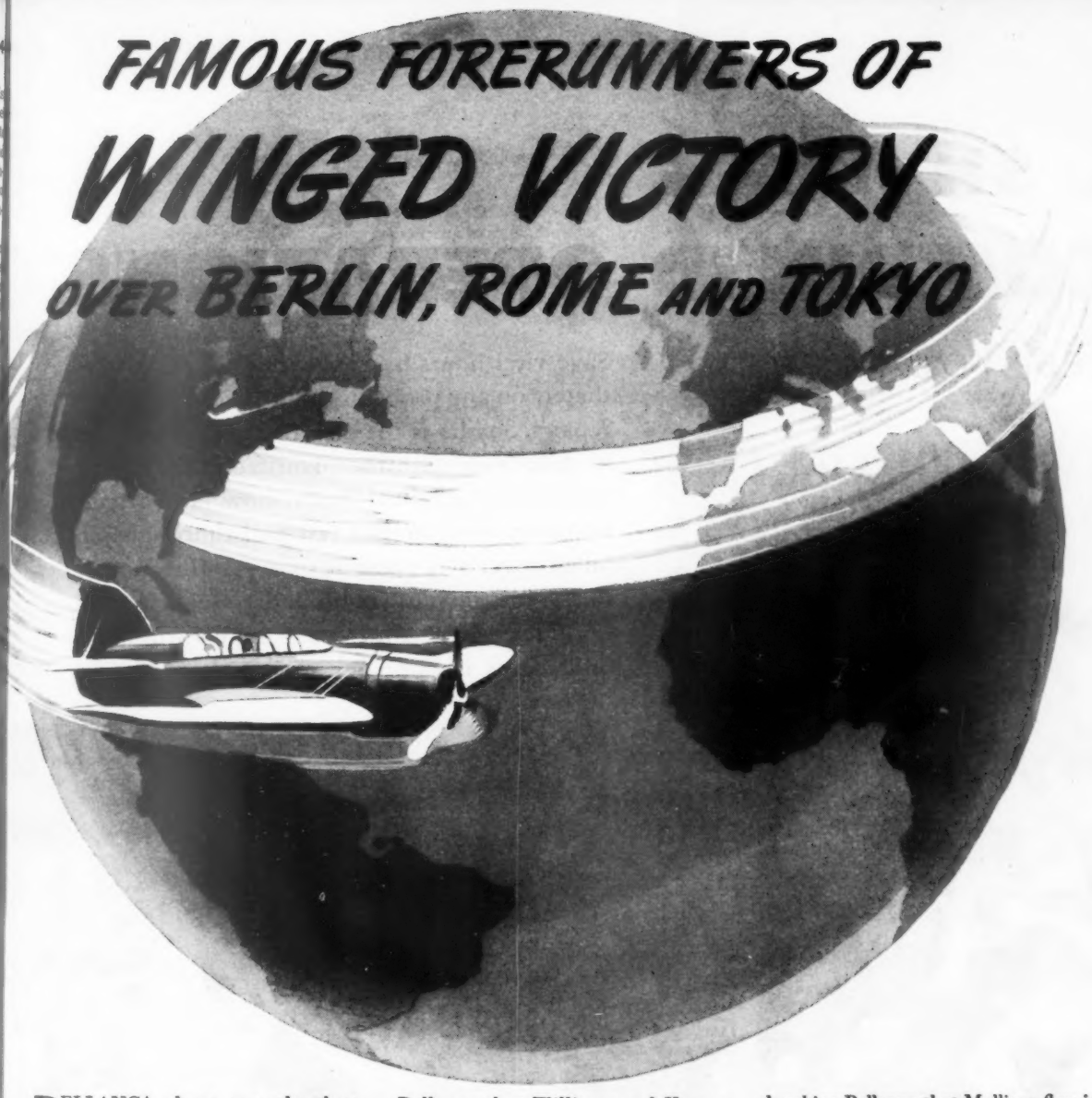
To get a general idea of the capacity of the usable air space, we may consider for a moment the existing 35,000 miles of civil airways with their 100,000,000,000,000,000 cubic feet of air space. The "box" of air space assigned in instrument weather to each aircraft is five miles wide, a thousand feet high, and ten minutes (30 miles at 180 m.p.h.) long, or 4,500,000,000,000 cubic feet. The air space in these airways could, therefore, theoretically hold over 22,000 airplanes simultaneously, under instrument flight rule weather conditions.

This figure is indicative of a possible limit for the next few years if the civil airways system is not expanded. These 22,000 airplanes, however, if constantly in the air and flying at an average of 180 m.p.h., would cover almost 100,000,000 miles per day, or about the total mileage flown by all air carrier flights in the entire year 1940.

Under contact flight rule weather conditions the "box" assigned to each aircraft can be allowed to shrink considerably. Under such conditions, or with the development of flying aids making it possible to conduct all flights under conditions similar to contact flight, the airways might conceivably hold some 200,000 or 300,000 aircraft simultaneously. This air space capacity, it must be repeated, is

(*Continued on page* 126)

# FAMOUS FORERUNNERS OF WINGED VICTORY OVER BERLIN, ROME AND TOKYO



BELLANCA planes gave the three Axis centers a preview of American air prowess many years before Hitler made the fatal mistake of starting this global war.

It was a Bellanca cabin monoplane that Chamberlin flew non-stop in 1927 from New York to Germany. It was a Bellanca that Williams and Yancey piloted in 1929 to Rome. And it was a Bellanca that Pangborn and Herndon guided over the Pacific on their sensational Tokyo flight of 1931.

These famous forerunners of winged victory blazed world sky trails which U. S. Army Air Forces are traveling with more and more powerful blows at our savage enemies.

Many other Bellanca transoceanic flights pioneered international air routes. Bellancas took Hoiriis and Hillig from Newfoundland to Germany in 1931 — Darius and Girenas from New York to Germany in 1933.

Of great significance was the 1931 world's record non-stop flight from New York to Istanbul, Turkey — the 5,000 mile classic negotiated by Boardman and Polando. And it was another record-breaking Bellanca that Mollison flew in 1936 from Newfoundland to England (9 hours, 15 minutes), an air trail now followed frequently by many United Nations warplanes.

Another historic trail-blazer was the Bellanca flown by Dr. Richard Light across the Atlantic, across Europe, across Asia and the Malay States to Manila — a prophetic path which many modern American planes are flying to Victory.

Yes, they were all Bellancas... these and the many other historic planes that pointed the way to progress through more than twenty years of American air power. And today Bellanca engineers contribute to Victory with their precision-built armament, warplane components and the AT-21-BL gunnery crew trainer. They're planning, too, for your personal peacetime plane!

***Historic Bellanca Flights***

1 — N. Y. to Germany, 1927 (Chamberlin)
2 — Maine to Rome, 1929 (Williams-Yancey)
3 — Tokyo to U.S.A., 1931 (Pangborn-Herndon)
4 — N. Y. to Istanbul, 1931 (Boardman-Polando)
5 — Newfoundland to England, 1930 (Boyd-Connor)
6 — Newfoundland to Germany, 1931 (Hoiriis—Hillig)
7 — N. Y. to England, 1931 (Pangborn-Herndon)
8 — N. Y. to Germany, 1933 (Darius-Girenas)
9 — N. Y. to Ireland, 1934 (Pond-Sabelli)
10 — Newfoundland to France, 1934 (Adamowicz)
11 — N. Y. to Manila via Europe, 1934 (Dr. Light)
12 — Newfoundland to England, 1936 (Mollison, piloting speed plane pictured above)

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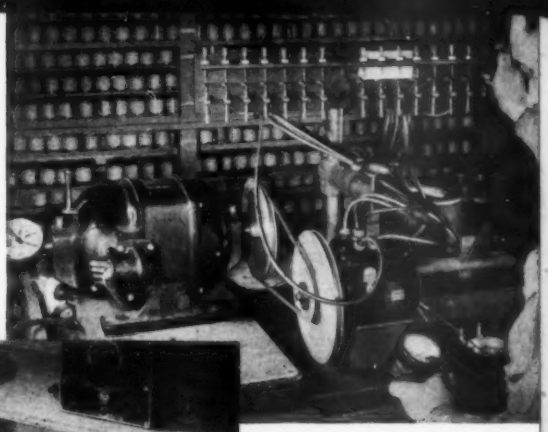

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# SNYDER AIRCRAFT
## CORPORATION

MUNICIPAL AIRPORT, CHICAGO 38, ILLINOIS • SULLIVANT AVENUE AIRPORT, COLUMBUS 4, OHIO

(*Continued from page* 122)

purely theoretical. To obtain a practical measure of the maximum traffic flow which the air space of the airways can accommodate, it is necessary to abandon consideration of the country as a whole and to study the rate of traffic flow in a single stretch of airway.

Assuming that an average stretch of airway has usable altitude levels of 3,000 to 18,000 feet (16 levels), it can, under present instrument flight rules, where lateral separation is practicable, accommodate two airplanes at each level every 10 minutes, or a total of 32 airplanes every 10 minutes. Thus, its theoretical capacity is 192 movements per hour. Practically, the capacity can be considered to be 125-150 per hour, because variation in speed of different types of aircraft and provision for climbing and descending prevent complete assignment of the available air space.

These figures are based on the present state of technical developments and are expected to hold true for the next few years, say through 1947. A comparison of this 125-150 rate with the graphs of Figures 6 and 7 shows that this capacity will be adequate for the busiest sector of the New York Airway Traffic Control Area until some time in 1948, and of the Washington Airway Traffic Control Area until 1949.

Developments during the latter part of this decade can be expected to make great increases in the capacity of airways. The more general use of pressure cabins can be expected to increase the number of altitude levels commercially usable. An increase to 25,000 feet will alone increase the practical airway capacity 50 per cent (180-225 per hour).

Some form of seperation indicator can be confidently expected soon after the war as the result of development of similar devices for war purposes, thus making it possible to reduce the necessary separation between succeeding aircraft to not more than 10 miles. Aircraft speeds can also be expected to increase. If this results in raising the average speed only to 250 m.p.h., the hourly capacity, considering the use of higher altitudes and reduced separation, will reach 400-500 movements. The highest rate expected through a sector up to 1950, is approximately 220 per hour.

These figures show that airway capacity *need not be* a limiting factor in air transportation. However, this assumption is based upon practical lateral separation of two aircraft on opposite sides of a radio range course at the same altitude. Lateral separation on many present-day radio ranges has been unsafe due to peculiarities caused by terrain and weather, thereby causing the capacity of the respective airways to be reduced to only half the capacity figures previously given. New type radio facilities being developed are expected to remedy this condition. Therefore, airway capacity can be expected to expand as necessary to handle the increasing traffic flow.

However, even if this expansion is delayed, the limiting factor will not be present in all weather conditions. A very common weather condition is a low layer of clouds, the base of which, and accompanying weather beneath, presents instrument flight rule weather conditions, but the top of which is only about three or four thousand feet above the ground. Under this type of weather conditions, aircraft flying at or above 5,000 feet above the ground have weather conditions which are better than contact flight rule minimums and require little or no separation by airway traffic control as long as they remain above the top of the cloud layer. Pilots of aircraft under these conditions must conduct their flights by reference to instruments and radio, but as long as they are above the cloud level, can avoid collision by watching for other aircraft in the same manner as under contact flight rule conditions. The net result is a possible traffic flow above the cloud layer equal to contact flight rule capacity, but requiring just as much control as under any other instrument weather conditions when descending for a landing or climbing after take-off, and requiring the same amount of posting and control work in a center as if the entire flight were made in a solid cloud bank.

Therefore, even if it is not possible to expand airway capacity as it becomes necessary, such a limitation will not affect the traffic flow under all weather conditions.

Much has been said about "air traffic" and "aircraft movements," all regarding aircraft *in flight*. Every one of these movements *must* originate *and* terminate at an airport. Unlike automobile traffic, aircraft can operate only to and from a specially prepared landing area, a condition which will certainly continue until at least 1950. Here lies another possibility of a limiting factor to the growth of air traffic.

At the present time airports have different capacities under contact and under instrument flight rule conditions, just as airways have. Most have but a single runway in any one direction, and, as only the runway parallel to the current direction of the wind can be used for landings and take-offs, only one aircraft can be landing *or* taking off at any one time. Under contact flight rule weather conditions today an average of one landing or one take-off can be handled every minute, giving at rate of 60 movements per hour. With extremely close co-operation between the pilots and the tower, this rate can be increased to 75 movements per hour where adequate taxiing facilities exist.

Under instrument weather conditions there is a sharp falling off in airport capacity. Aircraft arriving over an airport of intended landing maintain radio communication with airline radio operators or radio operators at airway communications stations until, in accordance with instructions from Airway Traffic Control, they have descended to their approach altitude and are instructed to start their approach and contact the airport control tower for further instructions. The aircraft then proceed to make an "instrument approach"; first crossing the radio range station at least 1,000 feet above the ground, then proceeding away from the airport for three to five minutes, making a "U" turn and proceeding back, descending to the minimum allowable height above the field. The landing is made after the aircraft descend below the base of the clouds and can see the airport. Until an aircraft has completed its approach and landed, or is in sight of the control tower and landing, succeeding aircraft are required to maintain their assigned altitudes. The result of this procedure, with its inherent communications lags, has been the restriction of landings to one every 10 or 15 minutes, with one or two take-offs in the same time, giving a capacity of eight to 15 movements per hour.

In order to speed up this landing process, a new type of approach has been developed wherein the pilot starts descent toward the airport on passing over a radio fix a short distance out from the radio range station so as to cross the station at an altiude less than 1,000 feet above the ground and continue his descent toward the airport until below the cloud level. This is called a "straight-in approach," and permits one landing every five to 10 minutes, or a rate of 15 to 24 movements (landings and take-offs) per hour. This rate is very difficult to maintain, due to communications lag. Every report from the pilot to the center and all instructions from the center to the pilot must be relayed through an airway communications station or airline radio station, and, under present procedures, the pilot does not contact the control tower until he is below the clouds and ready to land. This communications lag can be eliminated entirely by procedures now being developed wherein the control of all aircraft within a short distance from the airport is delegated to the control tower at that location, and the pilot contacts the control tower for his instructions upon reaching a designated point on his inbound route. Under these procedures the tower also controls outbound aircraft in the same area, coordinating inbound and outbound traffic. These procedures are called "Approach Control." Approach control procedures, used in conjunction with properly located radio aids for straight-in approaches, can increase airport capacity in instrument weather to approximately 30 aircraft movements per hour. (See "Approach Control," FLYING, January, 1944.—Ed.)

These instrument approach procedures depend upon the aircraft arriving below the cloud base at a sufficient height above the ground for the pilot to maneuver the aircraft to a landing by visual reference to the ground. Improved radio facilities being installed as rapidly as equipment is available, provides an instrument landing system given the pilot a narrow radio channel, or "glide path," down which he can guide his aircraft to a landing even without being able to see the airport until after landing. This instrument landing system will permit landings in weather conditions which previously prevented any aircraft operations, and may increase airport capacity in instrument weather, when used with approach control, to more than 30 movements per

(*Continued on page* 130)

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Today everyone is familiar with precision bombing and the increased accuracy made possible by the Minneapolis-Honeywell Electronic Automatic Pilot. Yet this is but one of a number of M-H electronic controls in daily use in all war theatres which, for the time being, must remain secret.

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# SQUEEZE THAT MONEY, BROTHER ... IT'S MINE TOO!

**SURE**, that Saturday night pay envelope's bulging. But let me tell you something, brother, before you spend a dime . . . *That money's mine too!*

I can take it. The mess out here. And missing my wife and kid.

What I *can't* take is you making it tougher for me. Or my widow, if that's how it goes. And brother, it *will* make it tough—if you splurge one dime tonight. You're making money. More money than there's stuff to buy. Money that can sock the cost of living to kingdom come—if you blow it! So hang on, till the job's done. On to every last dime—till the squeal means a hole in the seat of your pants!

*You're* working . . . and *I'm fighting* . . . for the same thing. But *you* could lose it for both of us—without thinking. A guy like you could start bidding me right out of the picture tonight. And my wife and kid. There not being as much as everybody'd like to buy—and you having the green stuff. But remember this, brother—everything you buy helps to send prices kiting. Up. UP. AND UP. Till that fat pay envelope can't buy you a square meal.

Stop spending. For yourself. *Your* kids. And mine. That, brother, is sense. Not sacrifice.

Know what I'd do with that dough . . . if I'd the luck to have it?

I'd buy War Bonds—and, God, would *I* hang on to them! (Bonds buy guns—and give you four bucks for your three!) . . . I'd pay back that insurance loan from when Mollie had the baby . . . I'd pony up for taxes cheerfully (knowing they're the cheapest way to pay for this war) . . . I'd sock some in the savings bank, while I could . . . I'd lift a load off my mind with more life insurance.

And I wouldn't buy a shoelace till I'd looked myself square in the eye and knew I couldn't do without. (You get to knowin'—out here—what you can do without.)

I wouldn't try to profit from this war—and I wouldn't ask more for anything I had to sell—seeing we're all in this together.

I've got your future in my rifle hand, brother. But you've got both of ours, in the inside of that stuffed-up envelope. You and all the other guys that are lookin' at the Main Street shops tonight.

Squeeze that money, brother. It's got blood on it!

**Use it up . . . wear it out, make it do...or do without**

**HELP US KEEP PRICES DOWN**

*A United States war message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by the Magazine Publishers of America*

(*Continued from page 126*)

hour, since it permits a less complicated and more efficient straight-in approach.

Devices now in civilian development and others produced for military purposes, but capable of adaptation to civilian use, can be expected to make it possible to indicate to pilots the position of nearby aircraft, as well as to show an airport traffic controller the exact position of all aircraft in the vicinity of his airport. This will permit aircraft to operate much closer together without hazard of collision and will allow airport traffic controllers to set up an extremely compact landing sequence, direct each pilot quickly to the glide path and land aircraft in rapid succession. As such devices are perfected and gradually come into general use, aircraft operation in instrument weather conditions will differ less and less from operation in contact weather conditions. Airport capacity in instrument weather should then approach that in contact weather—75 movements per hour, using only one runway.

All airport capacity figures developed in the discussions above relate to airports at which, at one time, only one runway can be used for a take-off *or* a landing for any particular wind condition. Additional capacity can be provided, and has already been provided at a few airports, by installation of dual runways. This means construction of two parallel runways in each direction, as far as possible from each other. Such dual runways permit one aircraft to be landing and another to be taking off at the same time, resulting in approximately doubling the traffic capacity.

A study is being conducted to determine an airport design which will provide for an even greater traffic flow. One design under consideration provides four parallel runways for each direction. Installation of parallel instrument landing systems will make the increased capacity of such airports available in all weather conditions.

Whenever the air traffic to and from a city grows beyond the capacity of one airport, others will be added. Many cities are already served by more than one airport, and other large municipalities have started programs to provide them with multiple airport facilities. It is a part of the future plans of the air transportation industry as a whole to parallel the principles of the railroad industry in providing terminal facilities in large cities. In other words, there will be one or more airports for passenger-carrying commercial aircraft, additional airports for freight (possibly private freight airports for individual companies) and other airports for private flying activities. Private and commercial flying are steadily growing farther apart, insofar as their respective airport requirements are concerned. Airline aircraft require longer and better constructed runways and special terminal building and hangar facilities. Private aircraft do not require such long runways and their hangar and other servicing needs differ from commercial aircraft. This will tend to simplify segregation of the different types of traffic. Military agencies, as a rule, also need separate airport facilities fitted to their own special requirements.

New York City is a good example of a metropolitan area served by multiple airport facilities at the present time. La-Guardia Airport provides principally for airline operations, Floyd Bennett Field for Navy aircraft, Mitchel Field for Army aircraft, a number of private airports for various aircraft manufacturing concerns which own them, and several other airports normally for private aircraft. Newark Airport and Roosevelt Field, in this latter classification, are at present being used by the armed services. Such an array of airport facilities, with the addition of the Idlewild Airport being planned at the present time, can handle a heavy traffic flow.

A multiplicity of airport facilities and segregation of the classes of traffic result in only minor operating difficulties insofar as air traffic control procedures are concerned. Traffic can be divided at some distance from the terminals and brought to each airport along separate paths. It must be realized, however, that these principles can be applied only to a grouping of airports *not too close together*. The location of additional airports about one municipal area must take into consideration the paths of traffic flow at these airports—for unless the locations are carefully planned, conflicting traffic can reduce the overall capacity of the group of airports to little more than the capacity of one airport.

Although it should be possible to install instrument landing systems and commence operation of approach control procedures at most major airports in the next two years, it is quite probable that these improvements alone would not make it possible to handle efficiently, in instrument weather conditions, the expected peak traffic in the busier areas. The peak 1947 traffic rate for the New York Airway Traffic Control Area is estimated to be almost 400 instrument flight plan movements per hour. In order to handle these movements there would be required *at least* 10 to 15 airports fully equipped with instrument landing systems, proper taxiing facilities and approach control, for instrument flight plan traffic only constituting only a portion of the total local traffic at any airport.

The peak traffic rate is estimated to rise to more than 700 instrument flight plan movements per peak hour in the New York area by 1950. This traffic will definitely require airports with more than one parallel runway for each landing direction and installation of parallel landing systems.

Airport capacity need not limit the expected growth of air transportation. By expansion of airport facilities and installation of new procedures and devices as the need develops, any anticipated flow of traffic can be provided for. (A detailed study on necessary general expansion and improvement in airport facilities will be presented in a later report.)

Even should some of these improvements be delayed, however, airport capacities will not be inadequate in *all* weather conditions. Borderline weather conditions, in which the ceiling and visibility at an airport are sufficiently high to permit contact flight rule landings, although most of the traffic along the airways is operating on instruments, are not infrequent. The airport capacity is then at a maximum.

Should the airport capacity be inadequate under instrument landing conditions, it is under just such borderline conditions that traffic peaks are likely to occur. When instrument weather restricts aircraft operations, *all* the pilots affected will not decide to cancel their flights or to use other means of transportation. They will continue to do the same as they do today—wait for improving weather conditions. As soon as the weather improves sufficiently to permit landings under contact flight rules they will take to the air, causing a peak in controlled instrument operations along airways where the visibility is still low.

Airport capacity can be made adequate for expected traffic peaks in all weather conditions. Facilities will have to be improved and additions made to permit necessary airport operations under instrument flight rules, and even under contact flight rules in some cases. However, even though airport capacity in instrument flight rule conditions lags behind for some time, there will be occasions when airports operate under contact flight rules, and have adequate capacity for aircraft flying the airways under instrument flight rules and requiring full control.

The air space capacity of the airways has been shown to be sufficient for the peak traffic rates expected to occur with the expansion of air traffic. It has also been shown that sufficient airport capacity can be provided. Since these two factors need not limit the growth of air traffic and definitely will not under *all* conditions, air traffic control must be capable of handling the greatest expected traffic flow if it is not to become the limiting factor to the growth of air transportation.

### Conclusions

(1) Air traffic in 1950 is expected to be at least four times as high as in 1943; a rate of about 60,000,000 aircraft movements of which, it is expected, 20,000,000 will be caused by aircraft operating on instrument flight plans.

(2) This traffic corresponds to a rate of more than 200 movements per hour in the busiest sector of the New York area, and more than 700 movements per hour in the whole New York area.

(3) The air space of the airways will be adequate for the expected traffic.

(4) Sufficient airport capacity can be provided to land the expected traffic.

(5) Even if airway or airport capacity under instrument landing conditions should temporarily fall behind the growth of traffic, they will not limit the expected traffic flow under all weather conditions. Therefore, ATC *must* be capable of handling the *greatest expected traffic flow* or it will become the *bottleneck* in air transportation. END

# THE GENERAL 9 x 12 EXPANDER-TUBE BRAKE AND 7.50 x 10 WHEEL

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The General brake and wheel has passed rigid service tests . . . has proved itself under actual flight conditions both in below zero cold and blazing desert heat. Too . . . stringent Government requirements on the dynamometer test for the brake have been met and surpassed . . . as have structural strength requirements for the 2800 pound static load rating for the wheel.

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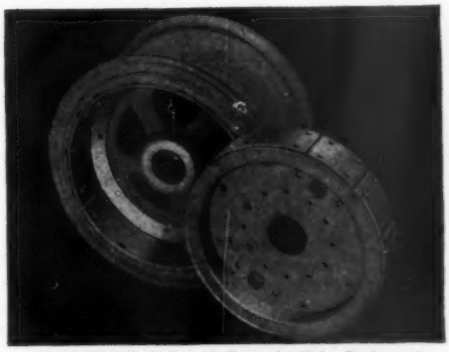

The GENERAL 9 x 12 Expander-Tube Brake and Wheel—*Partially Assembled.* Remember, you can depend on General for *longer* service life . . . *simpler* maintenance . . . *easier*, "softer" operation!

The GENERAL AIRPLANE BRAKE

THE BRAKE WITH A "Soft" Pedal!

## China Clipper

(*Continued from page 25*)

est proven engines. The seaworthiness specification called for a hull of the strongest possible construction. To this they added sea wings, short, stubby affairs like gills to give increased safety in operation on the water. They made hundreds of sketches and exhaustive tests of everything from wing sections to color schemes for the passenger cabin and finally they decided on the *China Clipper* design and formally entered it in the books as the M-130.

It took three years to fashion *China Clipper* from drafting tables and mock-up to preliminary water tests. Transpacific Division Engineer R. W. Beecher, now on active duty in the U. S. Navy, lived, ate and slept with the Martin design engineers between 1932 and 1935, working out with them details of *China Clipper's* construction, watching her grow rib by aluminum rib.

When she emerged from the Baltimore factory late in December, 1934, and spread her 130-foot wing for the first time she was the world's largest and most luxurious airliner—52,000 pounds gross weight. She was powered by four engines developing a total power of 3,320 horsepower (she has larger engines now) —she represented a long list of revolutionary innovations in construction. She exceeded all expectations in her trials, chalked up a cruising speed of 157 m.p.h. and a top speed of 181 m.p.h. and was officially licensed for 102.1 per cent of her empty weight.

She put in 10,000 miles droning back and forth between Miami and Puerto Rico before she hopped off for the Pacific to prove or disprove the practicability of operating air transports over long ocean routes. Then she flew down the Gulf and cut overland to Acapulco, Mexico, where she got her first view of the Pacific Ocean. She turned north and flew on to her temporary home and jumping-off place, Alameda Airport, across the bay from San Francisco, ready for her scheduled San Francisco-Manila service.

Meanwhile, the advanced scouts of Pan American, landing on tiny coral atolls through the booming surf, set up radio stations to guide the plane across the Pacific sky. They made friends with gooney birds, built hotels on barren sands to house ocean-hopping passengers. Dozens of survey flights had to be flown over the projected routes.

Take-off was set for November 22, 1935, a Friday. One hundred years before, to the day, the first clipper sailing ship had floated between the towering peaks that guard San Francisco Bay.

Early in the morning they started loading two tons of mail and express in *China Clipper's* hold, including 58 sacks filled with 110,865 letters—the first airmail ever to be flown across the Pacific. There was a world-wide broadcast. Newsboys were all over the place selling papers. More than 25,000 spectators came early and brought lunches.

The inaugural ceremony started at 3 p.m. Postmaster General Farley was the principal speaker. President Roosevelt sent a message. There were many speeches. Finally President Trippe took over. By radio he called the roll of the island stations — Honolulu . . . Midway . . . Wake . . . Guam . . . Manila. They boomed back: "Ready! . . . ready! . . . ready! . . . ready!"

President Trippe turned to *China Clipper* and Captain Edwin C. Musick and said:

"You have your sailing orders, proceed to Manila."

"Aye, aye, sir!" he responded. Cautiously *China Clipper* taxiied out of the harbor, through a flotilla of gaily decorated pleasure craft, then down the bay. A patrol boat flashed the word that the lane was clear and she roared into the take-off. It was exactly 3:46 p.m. Pacific Standard Time when she lifted off the water, eased into a comfortable climb and pointed her nose toward Honolulu, 2,410 miles away. The world's longest airline was in operation.

She hit Honolulu, the barren dots of Midway and Wake, then Guam and Manila, like clockwork. There was only one upset: she was one minute behind schedule landing at Wake. It was her own fault. Made an extra circle over the harbor.

She reached Manila in 59 hrs. 48 min. flying time. The schedule called for 60 hours. The fastest surface time was 21 days.

On the last leg of the return flight from Honolulu to the mainland she discovered Jones Corner, a spot now famous in transpacific air navigation. From Pearl Harbor she had flown northwesterly to a point 300 miles north of the halfway mark. Here she caught the full force of the trade winds and rode them to her destination. For future reference that point was named "Jones Corner." No one knows why; there was no one named Jones in the crew.

She arrived at Alameda Airport at 10:36 a.m. December 6, completing the 16,420-mile round trip in 123 hrs. 12 min. She had maintained an average speed of 133 m.p.h., had set 19 world records and had written herself into history as the first airplane to fly a major ocean on a commercial basis. A year later her achievements and the ocean-flying technique she developed were officially recognized, when Pan American Airways was awarded the Collier trophy, America's highest aviation honor.

Neither Wake or Midway boast natural vegetation and they have no cows. The workers were constantly thirsting for milk and on every trip *China Clipper* flew in a big supply, packed in dry ice.

During the two-year International Exposition on Treasure Island, San Francisco, *China Clipper* was a leading attraction to the millions of visitors. Most of her services were used to fly in orchids and other tropical flowers to keep the Pacific island exhibits supplied.

In April, 1936, passenger service was inaugurated and *China Clipper* was given the honor of flying President Trippe and a party of notables on a preview flight. In her years of service she has carried many important personages. Her No. 1 passenger was perhaps Ambassador Maxim Litvinoff of the U.S.S.R. whom she flew from Pearl Harbor to the mainland on the eve of the Japanese attack. She carried Doris Duke Cromwell so many times the press referred to the heiress as a "commuter." Three times *China Clipper* speeded Maj. Gen. Claire Chennault across the Pacific on missions concerned with the formation of the Flying Tigers.

In October, 1940, *China Clipper* carried a group of American Red Cross officials hurrying to the Orient to evacuate U. S. nationals and some Rockefeller Foundation scientists rushing to Cairo to halt a plague that was spreading among natives who bathed in certain rivers. The success of the medical mission must have contributed to the remarkable health of American troops in the North African campaign.

She carried oil company engineers going to Arabian fields to open new wells for the war to come, Chinese leaders shopping for airplanes and guns, Japanese schoolboys on all-too-frequent visits home, munitions and scrap metal salesmen, babes in arms, and casual tourists.

The low point in her passenger-carrying record was reached in November, 1941, when she delayed a scheduled departure to pick up Japan's infamous Saburo Kurusu and carry him across the Pacific on his mission to lull America to sleep for the stab in the back.

A book could be written on the odd items she has carried in her cargo holds. They ranged from day-old chicks flown to distant islands in a poultry colonization experiment and queen bees on the same sort of mission to repair parts for trucks rumbling over the Burma Road and gowns for Hollywood stars vacationing in Hawaii.

Her records list most of her trips as "without incident." Once in the air there was little to contend with except weather and mechanical performance and almost always these were in her favor. In 1936 she hooked onto the tail end of a big blow and set a Honolulu-San Francisco speed record of 14 hrs. 2 min. [average speed: 172 m.p.h.] that stood for years.

She has performed many rescues. A week after she returned from her first trip to the Orient she was circling San Francisco bay in a test flight when her crew sighted a sailboat in distress. It was a rough day on the water and those aboard the boat were in real peril. She radioed the Coast Guard and then landed alongside to direct the rescue work.

In November, 1938, the New York office requested a photo of *China Clipper* silhouetted in the sunset above the Golden Gate. A commercial plane was hired to carry the cameraman. When the second plane moved alongside, crew members on *China Clipper* saw a stream of gas pouring from one of its wing tanks. The cap had been left off and at the

# Return from glory..

Here they come—back from another devastating raid over Europe. Sweeping in, while sunset hovers over this English landing field, each plane in the squadron makes a safe, cushioned landing on Aerols*.

In every climate and on every terrain, Aerols are serving on American aircraft. Today, Aerols insure smooth, safe landings for our victorious air force; tomorrow, they will provide equally effective service for America's expanding air commerce.

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rate the fuel was being sucked out by the wind the plane would be forced down in a few minutes, probably in the water. The camera plane had no radio.

*China Clipper* streaked for the nearest airport. The camera plane followed and was within easy reach of the field when its motor quit.

Many times she carried life-saving serums across the Pacific. Once she hurried home from Manila with a New York broker who had suffered a broken back in a Manila auto accident. The doctors were waiting on the mainland to operate. They said the speed of the trip and the absence of jarring travel motion saved his life.

*China Clipper* has also experienced tragedy. Her youngest sister, *Hawaii Clipper*, vanished July 28, 1938, during a scheduled flight between Guam and Manila. One minute the radio told of routine conditions. Then silence. *China Clipper* led a long search but no trace of the missing plane has ever been found. Her last surviving sister, *Philippine Clipper*, crashed into a California mountainside in a storm last January. On January 11, 1938, Captain Musick, *China Clipper's* first commander, was lost in the destruction of *Samoan Clipper* by fire. Fred Noonan, her first navigator, was lost with Amelia Earhart. George King, another of the first crew, was killed in a South American crash.

Her own closest call to disaster was in April, 1936, when her refueling barge broke loose in the bay and crashed into her wing. By some fast and fancy maneuvering she managed to escape with minor damage. That has been her only accident.

Through it all, *China Clipper* has been taking her regular turn in the North Pacific service which was increased from twice a month to weekly as air cargo and passenger business developed. For the first three years she and her sisters carried on the entire schedule. Then huge 74-passenger Boeing Clippers were ordered to assist on the North Pacific and to open a new run to New Zealand.

In April, 1939, after four years on the San Francisco-Manila run, she flew across the China Sea to extend the service to Hong Kong. The flight forged the last link in round-the-world air service.

*China Clipper* didn't get a publicity break in the first week of war. All attention was directed to the clippers at sea and their flights to escape enemy capture. When she hopped off as the first to fly back into the combat zone, military censors clamped down on the story. Unarmed and with her radio silenced, her only protection was cloud cover. She flew from one to the other and when no clouds were in sight dropped down and hugged the water. In the flight she set the pattern for post-Pearl Harbor clipper operations.

The only war story released about her was the evacuation of expectant mothers from Pearl Harbor after the Jap raid. Her cabin was equipped with all the requisites for handling childbirth but she always managed to beat the stork to the mainland.

Recently an attempt was made to balance *China Clipper's* books. Originally she was to cost $350,000 delivered at Miami, but $40,000 was added to pay for the sleeping quarters and other extras.

At the end of seven years and three months on the North Pacific route, her logbooks showed 15,769.31 flying hours and 2,400,000 miles; she had spanned the North American continent once and the Pacific 178 times—89 round trips at the last tabulation. Her engines, which had been increased from 830 to 950 h.p. each have consumed 2,340,000 gallons of gasoline and 31,200 gallons of oil. She is down in the books for $540,000 worth of fuel alone. In addition, she has carried but had not used 450,000 gallons of reserve fuel.

A total of 104 engines have been used to keep her flying. Each overhaul was budgeted at $1,576 for a total of $163,604. Five thousand spark plugs—so far—have cost $15,000. Baths to protect her from salt water corrosion cost $2,100—$10 each. Her dismantle overhaul cost $10,000. Her war paint job and the removal of luxuries in converting her to a military transport—$1,000. Ingredients for the meals and *China Clipper* cocktails served on the fly: $25,000.

To arrive at her total cost of operation accountants set an average of $350 an hour which figures to the staggering sum of $5,519,258.50. In addition there are the salaries of the 27 persons—weather men, radio operators, airway personnel, mechanics, traffic aides—who get her into the air and keep her flying, and the 54 persons who handle her maintenance and overhaul.

In the 87 months tabulated she has carried 370,000 pounds of express, 380,000 pounds of mail (about 20,000,000 letters) and 3,500 passengers. At the start she was paid $3.35 a mile for carrying 1,000 pounds of mail to Manila and when the run was extended to Hong Kong she got $4,950 extra for each outbound flight. For the return trip she was paid $25.35 a pound. In the year ending December 31, 1940, the total income for all Clippers on the North Pacific was $4,083,437.06. The mail income was $2,866,161.97 or 72 per cent. *China Clipper, Philippine Clipper* and two Boeings were operating on the route at the time.

Her passenger income has averaged $400 (the actual fares range from $278 from the mainland to Hawaii to $950 to Hong Kong). This makes a total of approximately $1,400,000 collected in fares for the period. For the 370,000 pounds of express she received about $555,000.

Of all her contributions to mankind, the most important was the pioneering of the sea routes and the development of ocean-flying technique. She should be credited with the conquest of the Atlantic, for the clipper planes operating there followed her system to the letter. In air cargo she has made many advances in packaging, preserving and stowing to save valuable shipping space and protect perishable goods. The multiple crew and revolutionary method of navigating across long unbroken stretches of water were other achievements. All these are now rendering valuable aid to the United Nations war effort on all the fronts. END

## Wolf Pack

(*Continued from page 34*)

entirely with Grumman *Wildcats*, the chunky fighters that were inferior to the Zeros except in endurance and firepower.

Most of all, such a record was to be achieved with the loss of only two pilots. This feat remains unequalled by any fighter squadron in the South Pacific combat area. Most other fighter units lost from three to eight times that number.

Two dozen pilots, 234 enlisted Marines and a hospital complement sailed from the West Coast. By early November they were at Henderson Field on Guadalcanal ready for action.

They were greeted by 27 Mitsubishi bombers protected by eight Zeros. Anti-aircraft fire picked off five bombers and a fighter but the squadron got none. Dense clouds and low ceiling prevented any aerial combat.

Two days later in the afternoon, the squadron went out as escort to a flight of torpedo planes and divebombers on an attack against enemy destroyers. Lieut. Horace Gillette Cleveland III drew first blood.

The little blond lad from Darien, Conn., got a Zero in his sights and blew it out of the sky. He was the only one to score. The rest, low on gas, came back empty-handed. One pilot landed in Tulagi harbor across the water from Guadalcanal and was picked up by a patrol boat.

Cleveland was proud of his exploit. He went from one pilot to another describing how it was done: how the engine had plummeted out of the flash of flame and the wing had floated down to the water like a falling leaf.

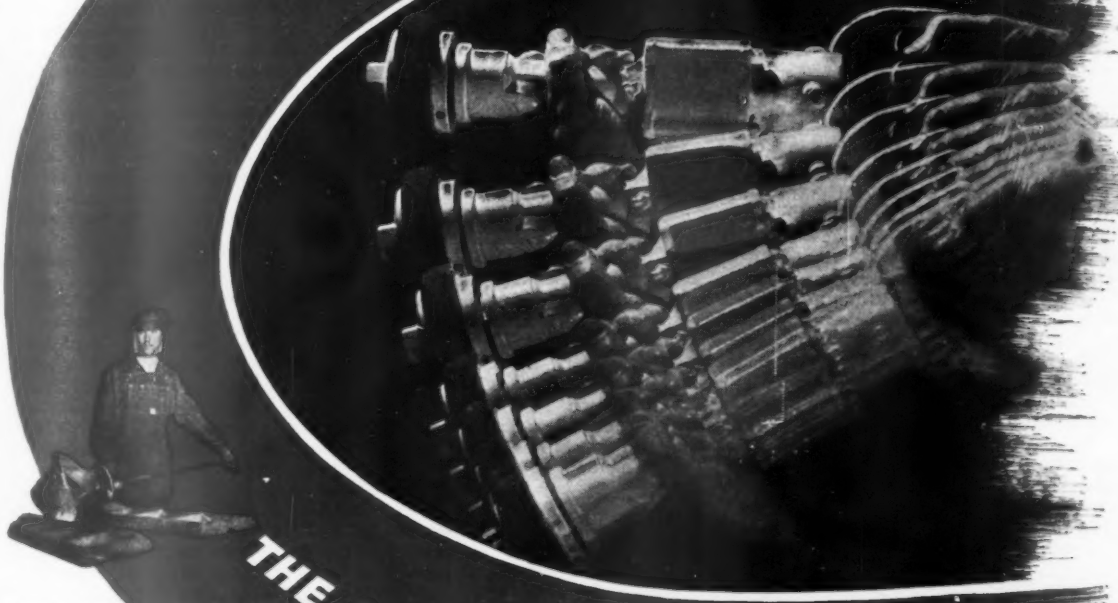
He picked off another a few days later but it cost him his flying career. He ran into a flight of 17 Zeros alone and attacked in bravado. One went down in smoke. Cleveland, diving to escape the vengeance of the others, lost consciousness because of lack of oxygen. He hurtled down in an 11,000-foot dive. When he regained his senses, he was diving at nearly 450 m.p.h. toward the water, 2,500 feet below.

He pulled out. But the strain was too great. He was under a pressure of 14 G's, 14 times his normal weight. His landing at Henderson Field was a masterpiece of control. He collapsed when he climbed out. The doctor diagnosed severe internal strains.

His *Wildcat* had had every rivet pulled loose. There were wrinkles in the aluminum skin and the wings drooped like those of a tired pigeon.

Cleveland went to the hospital. He

# DOW magnesium



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recovered but was killed in an operational crash two months later.

On November 11, the Japs decided not to observe Armistice Day. At 9 a.m. 20 Jap planes came over—12 dive bombers and eight Zeros to protect them. The squadron took off in brash confidence.

They learned a hard lesson. Coahran, a staff sergeant, got peppered on the first pass. He bailed out. The other pilots of the squadron circled his umbrella and protected him on the way down. Laird, a sandy-haired lieutenant from California, shot down a Zero while he circled. Coahran, however, landed behind the Jap lines. He never came back.

At 11 a.m., 22 high-level Jap bombers and six Zeros came over Henderson Field. Maj. Paul J. Fontana, the handsome 31-year-old commanding officer from Nevada, got his height and made the first pass. It seemed ridiculously easy. A clot of .50-caliber bullets struck one of the bombers and it promptly blew up.

Johnson, dark and voluble, a pilot from St. Louis, shot down a bomber. He was lucky. It had a mechanical machine gun that sprayed bullets in a circle from the rear. Johnson was sitting in the hub of the circle.

Pederson, Johnson's opposite in coloring and speech, poured bursts into another bomber. It went down but the inexperienced pilot made the mistake of following it. The Jap rear gunner, still full of fight, riddled his *Wildcat*. Pederson bailed out and made a safe landing on Tulagi. He later returned to base.

The great fighting days of November were at hand. The next afternoon, after a Zero had been shot down by a squadron pilot named Thomas at lunchtime, the squadron picked up 12 torpedo planes covered by 10 Zeros.

They were intent on the shipping in Guadalcanal Harbor. They roared down from 12,000 feet and skimmed at 50 feet over the water. After them came the squadron, diving through the heavy screen of antiaircraft from the ships. Fontana got one in his sights. It crashed in a billow of fire on the bow of a cruiser. He got another.

All around him the squadron was winning its spurs against the silver-sleek Jap torpedo planes with the orange rings around their fuselage. They were the only fighters to hit the torpedo planes. Foss' squadron was hovering overhead for protection.

Jap planes fell like burning leaves. De Blanc, a short, amiable southerner from Louisiana, got two torpedo planes. Secrest, a Mississippi lad, put a third out of the battle. Staff sergeants Conti and Hurst between them plugged two torpedo planes and two Zeros.

Wild Bill Wamel was hit by antiaircraft. He had to make a forced landing offshore and hurt his head when he lurched forward against his gun sight. Hurst, after flying through the entire battle with a faulty engine, was forced down between Guadalcanal and Savo Island. Fontana, out of ammunition, escorted him. Both were attacked by a Zero. Fontana and Hurst made a bold turn in his direction. The Zero, not knowing he had both at his mercy, turned tail. Hurst landed safely and was picked up by a patrol boat. Score for the day: seven torpedo planes and four Zeros.

The next two days were among the biggest in the career of the Wolf Pack. Fontana wrote: "The aerial activity which took place on November 12 was an enemy effort to soften the defenses of Guadalcanal in preparation for an enemy force which was en route from the enemy bases to the northwest."

Henderson Field took a terrific drubbing from naval and land-based Jap artillery as well as bombings during the night. At dawn the runway was gouged with a dozen huge shell craters. The dawn patrol—Secrest, Pedersen, Clark, and De Blanc—took off in darkness. Their guide was a flashlight held at one end of the runway marking the single straightaway of the field. They got off safely and came back only when their gas was gone.

In the meantime, Laird had gone up as escort to the *Dauntless* dive bombers that were attacking a crippled Jap battleship off-shore. He spied six low-flying Zeros and made a plunging overhead run. He scored on two.

Donahue, a tall, ebullient blond from Texas, was also in the air with his flying mates, Hughes and Bollman. Hughes tailed an enemy fighter for miles, firing until his ammunition was exhausted, but it failed to fall. "I still think it was tied up there," he said later. The string came loose when Donahue fired. The Zero flamed and went down.

Bollman also got a Zero in the hectic melee but his oil system was shot up. He made a crash landing off a little atoll. After swimming for an hour, he was picked up by natives. When a Higgins boat finally rescued him they discovered him munching a banana on the beach, reading a Western pulp story magazine he had found in one of the huts, and a native fanning him to keep off the flies.

Lieutenant Percy, a lanky, curly-headed pilot from California, escorting dive-bombers and torpedo planes, saved his life by a hunch. He had no aerial opposition but he made a turn on sudden inspiration. As he did, the sky turned black behind him and shrapnel whined past his plane. An antiaircraft shell burst in the exact spot he had been a split-second before.

Numerous strafing runs were made on destroyers to finish off the day. Captain Fraser, a thin, genial pilot from New York who was to become the leader of the Wolf Pack a little later, proved expert at this. His confreres dubbed his group "Simon le Fraser and his Seven Slaves."

On the next day, the Wolf Pack knocked out 14 Jap planes. "The situation at dawn of the 14th," wrote Fontana, "found that all enemy surface vessels had retired from the immediate vicinity of Guadalcanal but a large enemy force of approximately 28 transports and 20 warships had been sighted between the Russell Islands and the New Georgia group headed toward Guadalcanal. Our aerial operations today were concentrated on stopping this force. The operation was successful. Aircraft accounted for sinking the largest part of the enemy force and our Naval units moved in at night and accounted for the remainder."

At mid-morning Fraser led seven of the pilots in an attack. It was directed against the invasion force, covering 13 dive-bombers and torpedo planes. Six Zeros dove on the squadron. All of them were shot down. The Wolf Pack cubs were becoming lobos. No member of the unit got more than one—and they rejoiced at this display of co-operation.

At four in the afternoon Fontana led a flight to cover another dive-bombing attack. A cloud of Zeros came down on them. The whole sky became "one mass dogfight." The squadron came out without a scratch with one exception—Staff Sgt. Thomas Hurst.

While his companions were knocking off seven enemy fighters, Hurst ran head-on into another at 10,000 feet. He got in two bursts, and started the other smoking. The Jap, in a suicide maneuver, cut upward and sheared off Hurst's wing.

Hurst bailed out and landed near a Jap patrol boat. They started to fire at him but he escaped by hiding behind his life-jacket. He swam all night and all the next day and until two in the morning the next day. He slept on a reef and swam on, finally reaching an island in a semi-delirious condition. He was picked up by the natives and nursed back to health after 47 hours in the water. At one point in his marathon a Jap shelled him with five-inch guns. He was picked up and returned to base at the end of the month by a *Catalina* flying boat.

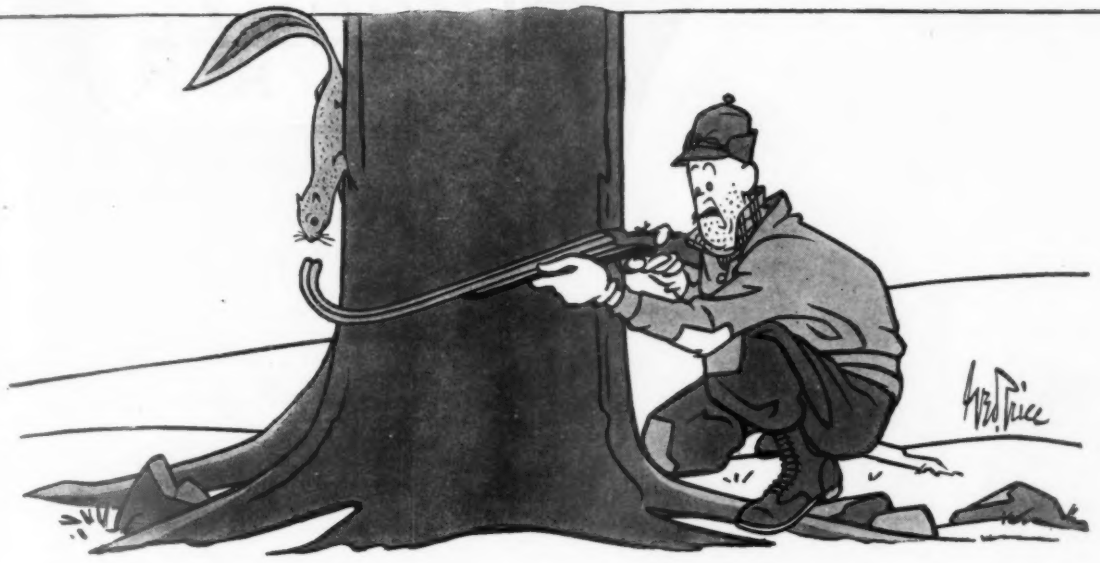
All that afternoon, Millimeter Mike, a Jap small caliber field piece, kept dropping shells into the field. Everyone felt their nerves on edge. No one whistled for fear somebody would mistake the sound for the approach of a shell. No one ran. If they did, everyone else would run too—perhaps the first runner had heard an ominous sound that they hadn't. Worse was the fact that a mocking bird picked up the exact whistle of the Jap shells and began whistling on its own.

Burning Jap warships and transports were reported by every patrol. The pilots discussed the curious antics of the Jap pilots: how, when their ships were hit, they were catapulted into the air under little green chutes. And how at least two of them, when Wolf Pack pilots made a close circle to see what Japs looked like, slipped their chutes deliberately and fell to their death. One pilot recalled how a Jap Zero had contemptuously done a slow roll in front of him—and how, as contemptuously, the Marine had shot it down. Another reported that someone had said there were Jap snipers in the palm trees about the field. To relieve its feelings, the squadron pilots went out with tommy guns and shredded the foliage of every palm tree they could see.

A letter of commendation was received by Major Fontana on November 16 from the commanding general, Brig. Gen. Louis E. Woods, USMC, who congratulated his flight for its work on November 12. The men of the squadron did not feel as good as they might have about it. They believed their ground crews might have had a well-earned share in the plaudits.

*(To be concluded in the April issue)*

# New Way to Get Around Curves!



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DIE-CAST FOR SMOOTHER ACTION—EXTRA STRENGTH
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Excerpt from a letter written by a former Breeze worker, now in our armed forces.

While our ship was on the ground, I spied a Breeze ignition shield and told the mech, 'I used to build 'em.' He grinned and said, 'Best damn shield there is,' and with that my chest expanded to twice normal. A compliment like that from a motor doc reflects the swell job you folks are doing back home there on the production line. Keep it Up!

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**It All Depends on Past Associations and Present Circumstances**

There's plenty in a name—when it's the familiar trademark of an old employer, and a man runs across it thousands of miles from home.

It means a lot to him then, because he knows first-hand of the skill and experience that went into the manufacture of the product, of the inspections that it went through before it was judged worthy to wear that trademark.

And then he realizes what that name represents—the pride of a manufacturer in a product, confidence in the future of the enterprise. The trademark becomes a symbol of opportunity for the day when men will resume their places once again in a peacetime world.

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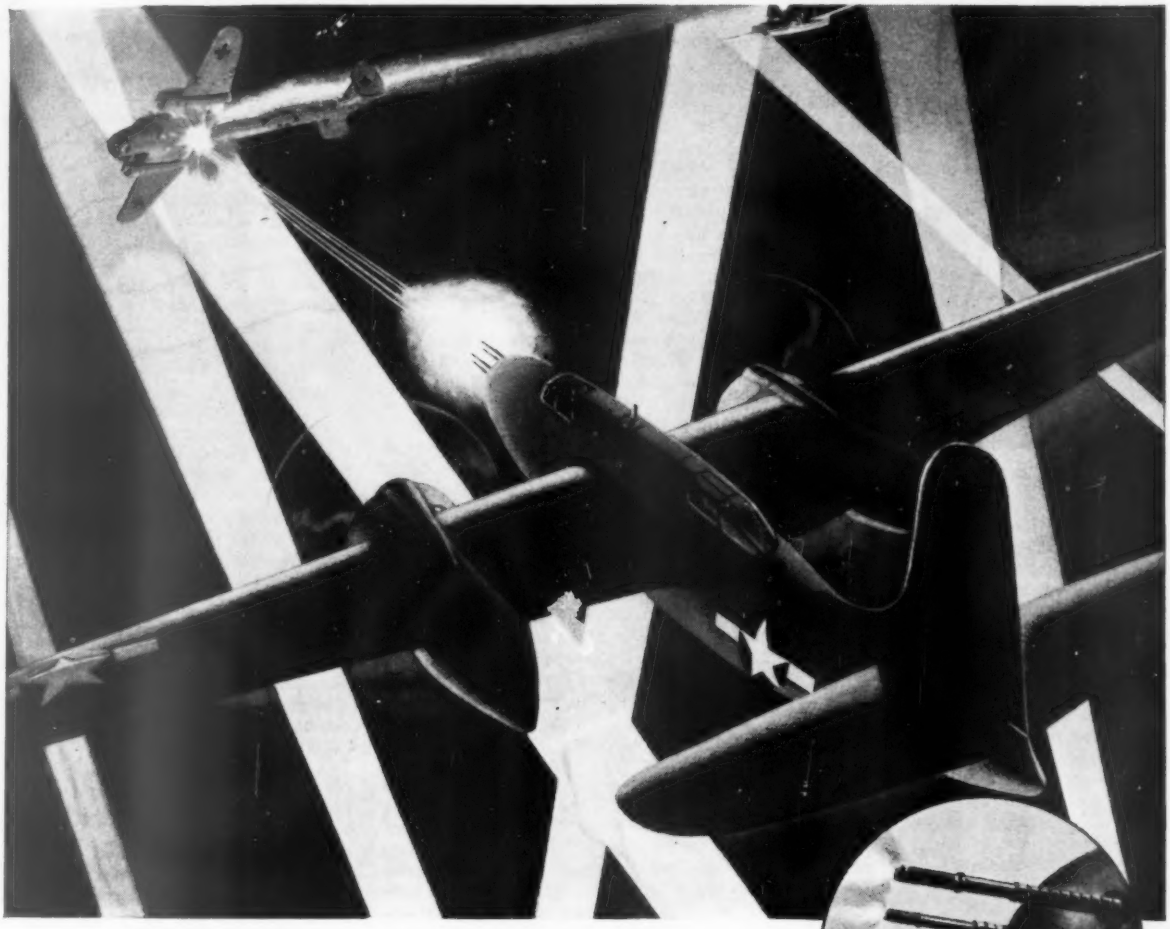
# *Midnight Mauler*

## WITH A HIGH-EXPLOSIVE PUNCH!



*Help fire this 4-cannon blast!*

## *New Douglas (P-70) Night Fighter has the fire-power of four 20 MM. cannon!*

*UP INTO the inky blackness of the night, straight and swift as an arrow to its target, a big new AAF fighter plane darts through the darkness, armed to the teeth with cannon! Searchlights fan out to help him. Watch! . . . they've caught an enemy raider in their glare. There's a roar, a blinding flash, an Axis bomber bursting into flames . . . another victim of the high-explosive barrage of this 4-barreled battery of fire-power!*

FIRE-POWER IS OUR BUSINESS!

Most details of the mysterious Douglas (P-70) Night Fighter are still a closely guarded secret. But this much our enemies know. One of the striking features of this "Midnight Mauler" is its armament of heavy-hitting artillery! The concentrated fire-power of four 20 mm. automatic cannon blazes away at one touch of the trigger! These are the same kind of long-range aircraft cannon that we of Oldsmobile are building for Army Ordnance, along with cannon for tanks and tank destroyers—shell for both Army and Navy.

A plane like this fires high-explosive cannon shell at a rate of over 2000 a minute! That costs money—money which must come from us at home.

**BUY WAR BONDS!**

# OLDSMOBILE DIVISION OF GENERAL MOTORS

*KEEP 'EM FIRING*

## Bombing Diary

(*Continued from page 58*)

reefs off Port Moresby, and on October 23 six *Fortresses*, led by McCullar, put skip-bombing to its first real test in combat.

"Our planes struck at Rabaul and it was really jackpot night for us. McCullar hit a destroyer from 250 feet, sinking it. Green (Capt. Franklyn T. Green) hit a 5,000-ton cargo ship, a large cruiser and put two hits on a 15,000-ton cargo vessel, causing a fire on the latter which burned for hours.

"Considerable damage was done to other ships in the harbor, and, best of all, not a single plane was lost in the attack. The Japs couldn't figure it out. Their gunners were shooting straight up in the air while we were coming at the ships from the side at almost mast level.

"Yes, we knew then that skip-bombing would really pay dividends, and the whole squadron worked to perfect the technique with the result that we had the almost unbelievable record of scoring hits with 72 per cent of all bombs dropped.

"Basically the principles of skip-bombing were simple. We approached the target at low altitude and high speed and let the bombs fall short of the vessel so they would dance along the water and strike the side of the ship. Through continued experiments we developed almost sure-fire methods of sighting, of calculating the distance of the bounce, and of the conditions necessary to make skip-bombing successful.

"It was dangerous in a way but hardly more so than any other type of bombing. Gunners aboard ships, we found, can keep a high-flying plane in their sights for a considerable length of time but they can't traverse their guns fast enough to get more than a shot or two at low-flying aircraft.

"And, very early, we also found that Jap fighter pilots would not attack a *Fortress* at very low levels where they cannot make their pet frontal attack.

"This Silver Star that I was awarded was a result of one of our early skip-bombing attacks. That was on November 18 when six of us went in to attack a heavily-protected convoy off Gasmata. I got three direct hits on a destroyer and the ship was seen to break in half and sink. Andy (Lieut. Lewis A. Anderson of New York) got a hit on a cruiser and the bomb must have found the ship's magazine for the vessel first started to burn and then exploded. McCullar and Lieut. William M. Thompson really played hell with some Jap landing barges and succeeded in sinking most of them.

"We went after warships again on November 24, hitting a convoy in Huon gulf which was apparently headed for Lae. This time we left two destroyers burning fiercely and probably sinking and also got a hit on a cruiser.

"We nearly lost McCullar that day. His plane was hit on the first run by ack-ack which exploded about 70 shells in the tail gunner's ammunition can. The gunner, Sgt. Charles Reser, however, smothered the fire.

"On the second run, McCullar's radio operator and two other men were injured by ack-ack, his No. 1 engine was hit and his controls damaged, but McCullar made still another run and this time his No. 3 engine was put out of commission. How he ever got back to Moresby we were never able to understand. The plane couldn't pick up sufficient altitude to clear the mountains but somehow McCullar was lucky enough to find a pass and sneak through."

During most of the fall of 1942, our squadron did not lose a single plane using the skip-bombing technique. In fact, until December, our only losses had been several aircraft and crews that crashed in Australia while the squadron was still in an embryo state and before it had gone "on strike" at Moresby.

The first loss in combat was on December 8 when Lieutenant Anderson failed to return from a bombing mission over Lae.

"Andy was my 'buddy' pilot but we lost track of one another in a storm," said Captain O'Brien. "He just never came back. That was last December, but when I left the South Pacific his wife was still writing him a letter a day.

"The War Department, of course, notified her and some of the boys wrote to her trying to explain just what happened, but she writes back that she is sure Andy will turn up in camp again one of these days and she wants him to have a letter a day from her when he does.

"Soon afterwards the squadron suffered another heavy blow. On January 18 a plane carrying Major Benn disappeared on a reconnaissance flight over Buna. Major Benn had been transferred from command of the squadron to a higher post in November but we were 'his boys' and his loss was something very personal to each one of us.

"It was he, more than anyone else, who helped conceive the skip-bombing tactics that McCullar and the rest of us put into practice, and it was he who was mostly responsible for making a first rate combat outfit of us. He called us his 'first-line team' and we were known as such throughout the entire Southwest Pacific.

"But despite our feeling of loss in the deaths of Andy and Major Benn, we had to keep at the Japs almost daily during December, January and February. We continued to attack their harbor installations and airdromes and wrecked several more convoys. There were reconnaissance flights almost daily.

"The Jap fighter pilots gave us ample evidence that they had high respect for the fighting qualities of the *Fortresses* and often the Zeros would refuse to intercept us. But we had more than one lively scrap.

"One of those dog fights almost meant curtains for me and my crew. We were over the Rabaul area again and the ack-ack from a cruiser carried away my No. 1 engine and destroyed the left elevator, making it hard to maneuver the plane.

"Just then 13 Zeros hopped on us and I had to dive within 20 feet of the water. I still don't know how the plane ever pulled out of that dive, but she did and we fought off the Zeros a good part of the way back to our base.

"In January we moved our permanent base from the Australian mainland to Jackson Field near Moresby. This enabled us to give better support to our ground troops who were driving hard against the Japs on the other side of the Owen Stanley Mountains. The jungles were full of malaria and some of the tales that the foot soldiers told us were harrowing.

"One time last February one of the infantrymen who had been in the Buna-Gona fight and then been confined to the hospital at Moresby for malaria asked Capt. James DeWolf if he 'could go on the next mission as he wanted to see the Japs get it good and proper.'

"We had a taste of Jap meanness ourselves on March 1 when we sighted a convoy of 22 ships, including cruisers and destroyers, heavily protected by a fighter screen. We flew out to the attack and for five days and five nights we had our hands full in the battle of the Bismarck Sea.

"We had a few *Lightnings* with us on the first day but most of the time we had to rely on our own gunners for protection. With Zeros attacking continually, sometimes as many as 10 or 15 to a single *Fortress*, our planes made their bombing runs.

"We shot down a good number of the Jap fighters, but Lieutenant Moore's plane was set on fire and plunged into the sea. Seven men were seen to bail out, all of the 'chutes opening. But I don't believe any of them were alive when they reached the water. The Zero pilots strafed them unmercifully as they floated down.

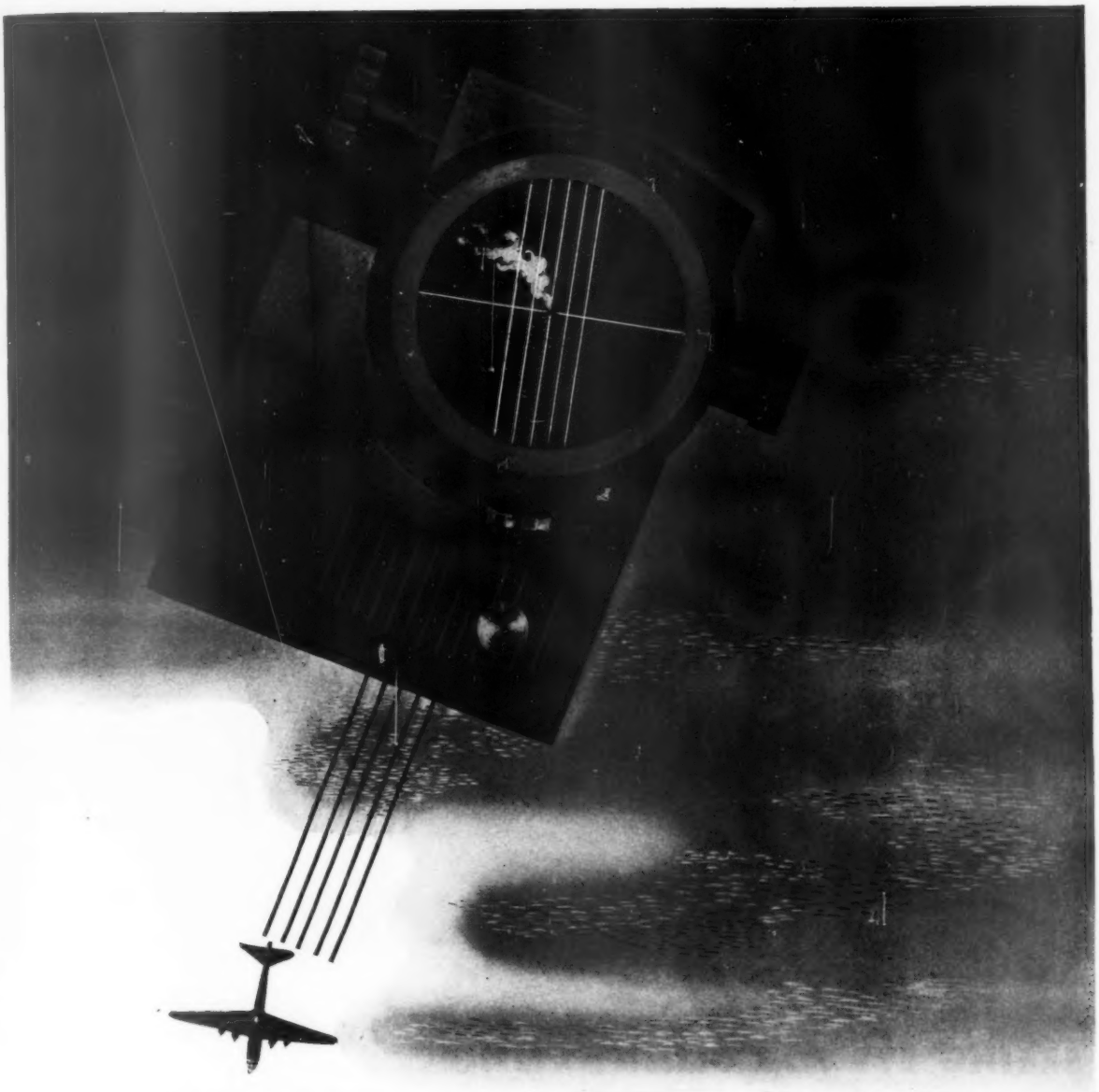
"It was one of those things that makes you mad—and burning mad. We hit those Japs plenty in the next few days. Major Ed Scott successfully bombed a large flotilla destroyer that night and he and the other *Fortress* pilots went down to within 50 feet of the water and gave the Japs a taste of what a real strafing means. What we didn't get the sharks got.

"One gunner expended 1,100 rounds of ammunition and burned out two guns. Every man in the squadron would have given two months' pay to have been in on that strafing.

"The next day we continued our strafing on landing barges which the Japs were attempting to put ashore at Lae. The PT boats, meanwhile, had come to help us with our work and by March 5 the convoy was annihilated. The lone destroyer which survived the first four days was caught running like hell for Rabaul and was promptly sent to join its dishonorable ancestors.

"For days and days after that our reconnaissance planes sighted barges and rafts with dead Japs all along the New

(*Continued on page 146*)



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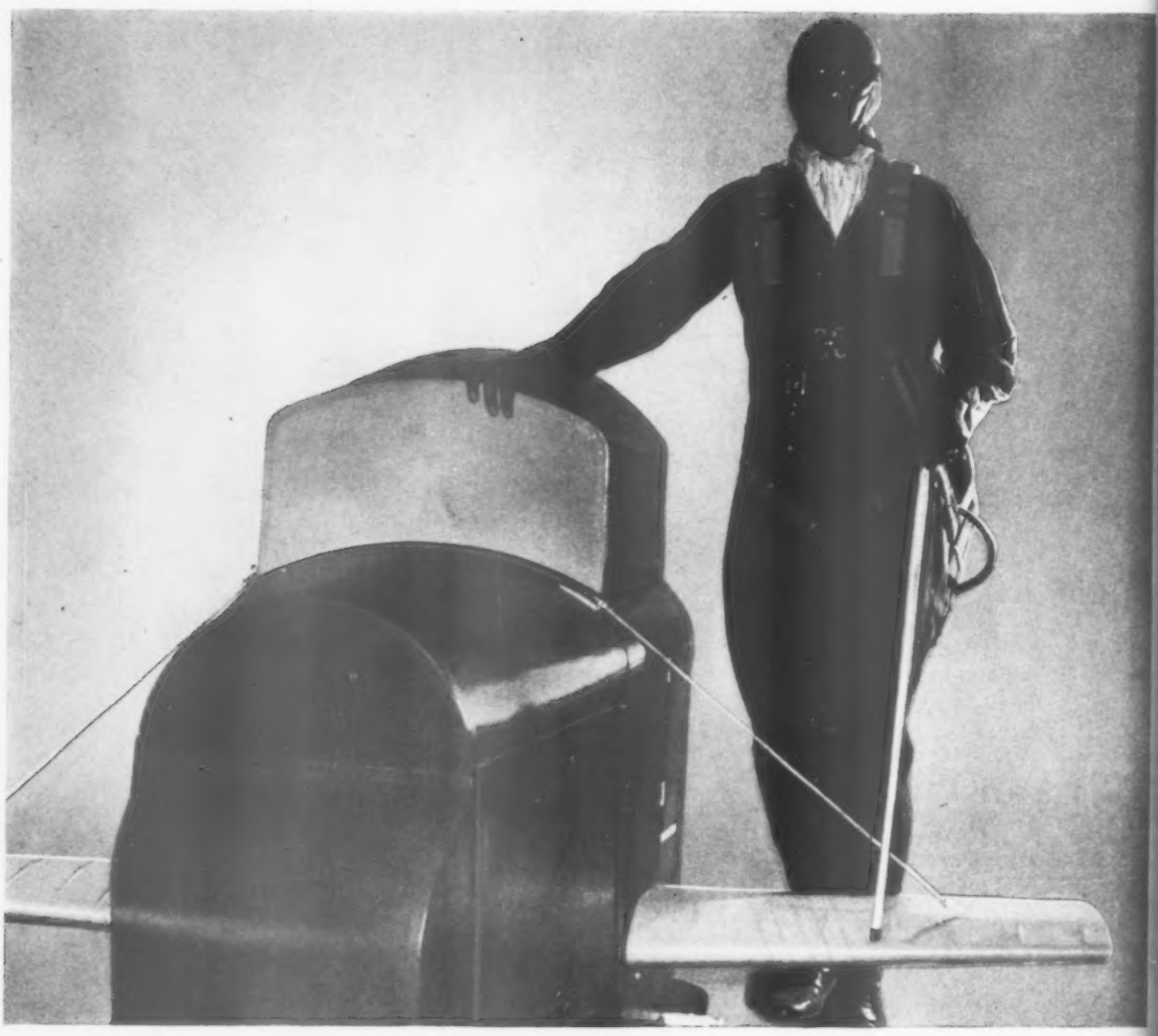

# SEEING EYE FOR BLIND FLYING

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**SYNTHETIC TRAINING DEVICES** developed by the Flying Training Command have played a generous part in the safety records rolled up by cadet schools all over the country.

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**THE CONTINUED USE** of such devices as these . . . here at Thunderbird, Thunderbird II, Falcon and Sky Harbor . . . has effected an uncommon success in Southwest's crusade for safety.

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SO far this is definitely a war baby. It was born to meet an exacting wartime need. Every one that is made goes right into the fight.

It is an electric motor designed for jobs which no regular electric motor could fill.

The jobs are on America's fighting planes. Working control flaps—opening and closing cooling shutters—lifting landing gears—and the like.

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# And HE learned about women from HER!

BUY MORE WAR BONDS

Sure—Herr Schicklegruber—woman's place is in the home. And NOW you know how far American women will go to protect the homes you threatened!

When the Battle of Production called for reinforcements — our American women acted — and magnificently! Today you are feeling the fruit of their toil as bombs from warwings they fashion rip the heart from your Reich.

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*Hydromatics* ON THE B-29

Dwarfing today's mightiest warplanes is the recently announced Boeing B-29 superbomber. Like the long-range Liberator and Flying Fortress bombers already in combat, it is equipped with four dependable Hamilton Standard Hydromatics. The B-29 propellers are built under license by Frigidaire.

HAMILTON STANDARD PROPELLERS

EAST HARTFORD, CONNECTICUT

ONE OF THE FOUR DIVISIONS OF UNITED AIRCRAFT CORPORATION

*(This illustration does not attempt to portray the B-29)*

(*Continued from page* 140)

Guinea and New Britain sea lanes and the few Japs who survived were seen landing for weeks throughout the D'Entrecasteaux group of islands.

"General MacArthur termed our victory one of the most annihilating combats of all time and General Kenney wired us: 'I am so proud that I could bust a fuse.'

"Our squadron lost only one plane during the entire engagement but soon after we were hit rather hard. First, Major McCullar was killed when his plane struck a small kangaroo during a takeoff at Moresby. The whole bomb group lost its best pilot in the accident which took his life.

"Then, early in May, we lost two planes within two days. One was piloted by Captain Heichel, who had been with the squadron from the start of its operations, and the other was flown by Capt. Robert Keatts, who had joined us that spring. Captain Heichel's plane disappeared over the New Ireland-New Britain area and Keatts is presumed to have crashed on the New Guinea coast between Finschhafen and Wewak.

"The only clue we had to the disappearance of either plane was a broadcast we picked up from Radio Tokyo, and it, we think, explains Captain Heichel's disappearance.

" 'On May 8, over Rabaul,' the broadcast stated, 'a pilot sergeant of the Japanese air force attacked a Boeing *Flying Fortress* after his best friend had been shot down by this same *Fortress*. He dived his Zero-type fighter into the *Fortress* and both planes exploded in midair. All men were killed.'

"I had a few more missions late in May and June and part of the time I was an 'aerial chauffeur' for Lieut. Gen. Walter Krueger, commander of the ground forces in the Southwest Pacific.

"When I finally left for the Australian mainland you could hardly recognize the squadron. Few of the old pilots were still with the outfit and even the enlisted personnel had changed greatly.

"Replacements had been arriving thick and fast during the spring and early summer and we welcomed them with open arms for they meant furloughs and —home." END

## Air Power in the Invasion

(*Continued from page* 23)

jectory is curved. In this case the shell, instead of going straight, goes up into the air and then curves downward to fall on top of the target.

In the Japanese siege of Port Arthur in 1904-05, for example, the Japanese had to send back to Japan and cut their heavy 11-inch coast defense mortars out of their permanent concrete emplacements because their naval guns could not reduce the Russian fortifications and their siege guns did not have heavy enough projectiles. When the mortars opened fire the fortifications began to crumble. Hence, *bomber attack must be made on fortifications and ground troops instead of being confined largely to factories, railways, roads, ammunition and supply dumps in the rear of the battlefield.*

In a successful attack there must not only be the preparatory fire on the enemy to soften him up before the attack but there must be an accompanying fire throughout the attack. The accompanying fire catches the enemy's defenders when they come out to man their weapons from the bomb-proof shelters where they have hidden while the preparatory fire was going on.

Apparently at Tarawa, one of the difficulties in providing an accompanying fire was because the flat trajectory of the naval guns on the warships could not always be used to furnish accompanying fire to our Marine infantry because of the danger of hitting them. Had we had ships with howitzers and mortars, their high angle of fire well over the Marines and dropping down on the Japanese a short distance ahead of the Marines would have greatly decreased our casualties. (In the Civil War of 1861-65, we had mortar ships. The Austrians used mortar ships on the Danube in 1914-18.)

The accompanying fire is the shield of today's infantry. Just as robbing the man in armor of his shield before the days of firepower left him open to attack, so today the opening of too big a gap between the accompanying fire and the infantry following it leaves the infantry open to attack. In this war the Russians have managed to separate the German infantry following its tanks from these tanks and thus have been able to break up and stop the German attacks.

The fortifications which the Allied troops will find on the invasion coast, and which must be broken through if our invasion is to be a success, are stronger than was the fortified line across Belgium and France from 1914 to 1918 because (1) we have given the Germans three and one-half years to make their coast defenses permannt fortifications, (2) the assault must be made from the sea, whereas in the last war the Allies had the greater part of France in which to establish their artillery, airfields and lines of communications, and (3) the supplies must be landed on the open beach under enemy fire, instead of in protected seaports as during 1914-18.

The French Coast was well fortified against an attack from England for years before the fall of France. There were some fortifications in Belgium and in Holland facing attack from England. Since the fall of these three countries in 1940, the Germans have been busy further fortifying these three countries against an attack from the sea. Of course, for years the fortification of their own North Sea Coast line has been of the most modern type.

The armament of the Maginot Line has been moved to the new coast defenses. The large amount of artillery taken from the Czechs at the time of the seizure of Czechoslovakia has also been put into these defenses except for the Czech field artillery which is in use by the German field ground forces.

Furthermore it should be noted here that, contrary to the belief of most of the public, fed by false propaganda of doubtful origin, it was not the permanent fortifications of the Maginot Line that failed but the lack of any such fortifications along the northern frontier of France. The Maginot Line ran north from the Swiss frontier to just east of the Sedan region. There were no fortifications on the long stretch of frontier from the neighborhood of Sedan to the English Channel. The Germans went through this gap. The Maginot Line fortifications were not attacked and captured. They held out until their garrisons were completely cut off by the German advance in their rear.

We are now probably building artillery powerful enough to break down such fortifications as the Maginot Line, which exist today in many parts of the German coast defenses on the continent.

However, the artillery will have to be landed before it can be used. Beachheads of considerable extent in width and depth must first be captured. Our experience in landing on the beaches of Sicily and Salerno, in both of which the Germans drove us back almost into the water before we succeeded, show that such operations need tremendous support in fire from the fleet and from the air. The difficulties of the former have already been indicated.

The reports coming from Italy to date show that the maximum American air power available has not been concentrated to add to the artillery preparatory fire.

Similarly, the concentration of airplanes, once the infantry and tanks have started their advance, has been less than that which could have been made. Such support as has been given apparently has been more concerned with communications in the rear of the battlefield than with the German infantry, tanks, and artillery directly opposing our troops.

Instead of aiding the American artillery with the maximum number of American bombers available by adding shuttle bombers from England to planes already based in Italy, we are using American bomber strength to bomb northern Italy, the Tyrol, Austria and the Balkans.

When the Russians, the Germans or the Japanese have any fighting on the ground or at sea they do not disperse their air strength by bombing cities, industrial plants and communications far removed from this fighting as we do. Instead they concentrate their aviation strength against the enemy's ground troops and warships.

Yet our Air Force regulations grant *third priority* to the only type of tactical effort which can effectively support our troops when the day of invasion comes—namely, direct aviation support of the ground troops in the zone of battle contact.

(*Continued on page* 150)

# SMOKE

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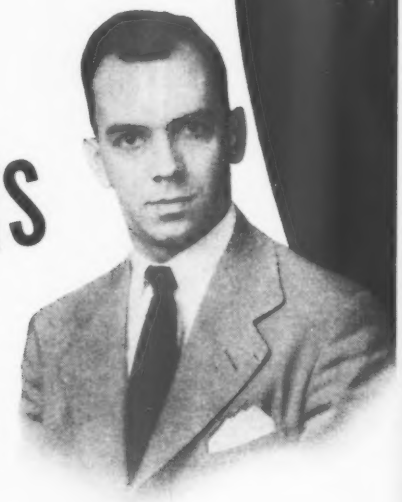

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**AOPA Pilot No. 8397**

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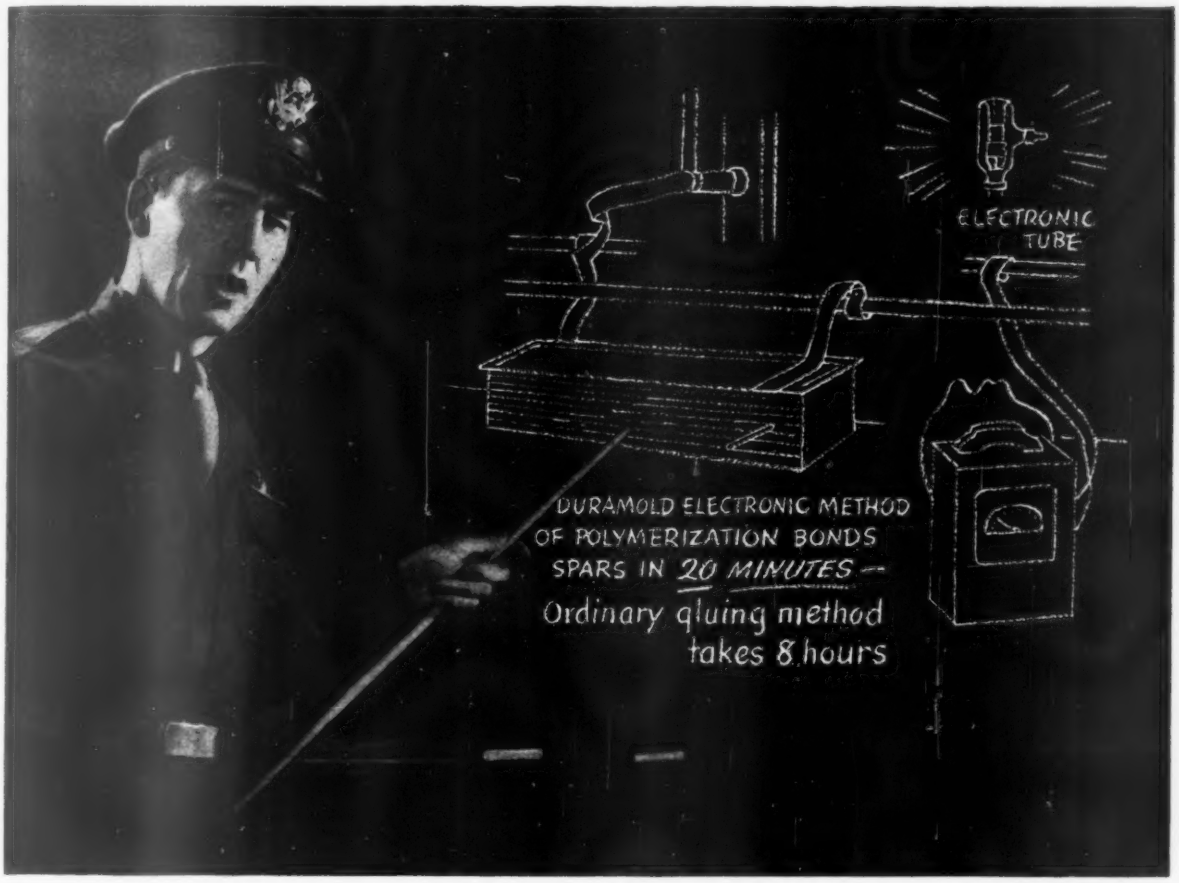
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DURAMOLD ELECTRONIC METHOD OF POLYMERIZATION BONDS SPARS IN 20 MINUTES —
Ordinary gluing method takes 8 hours

# Electronics Now Used in Making Aircraft Spars

Fairchild's Duramold engineers have harnessed the electron to a new and urgent task—the manufacture of spars, backbones of our airplanes.

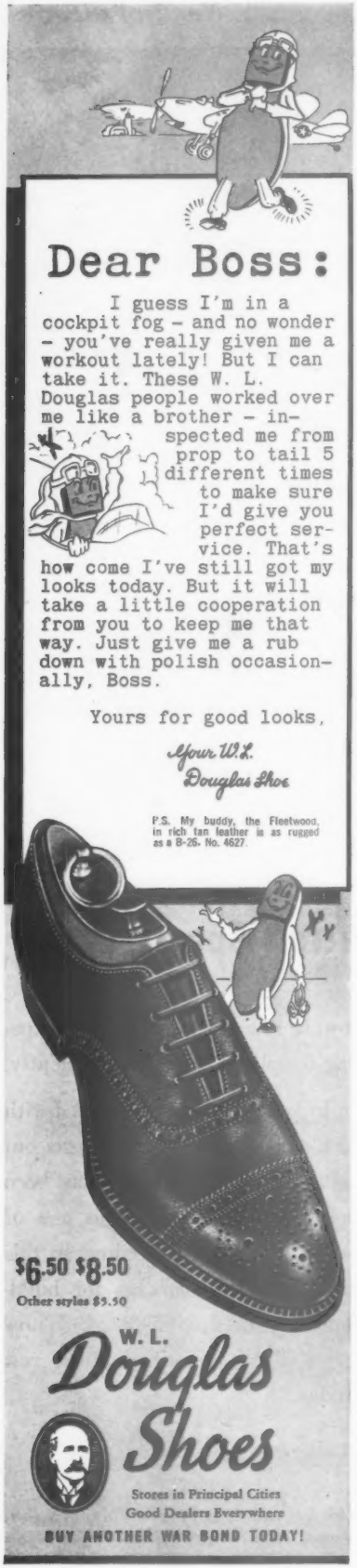
Usual plywood techniques for joining thin layers of wood could not be applied in making heavy wooden aircraft components. New methods were needed and *in a hurry*.

Fairchild engineers found the solution in electronic energy, employing radio high frequency with an apparatus similar to that used by radio stations in sending out short wave broadcasts but designed specifically for heating the plastic adhesives efficiently.

Heat generation by radio frequency, coupled with the use of special plastic adhesives, now turns out better, stronger spars. Production time has been reduced from hours to minutes. The use of electronics has become standard procedure in this phase of Fairchild's Duramold process for building plywood structures—another instance of how Fairchild engineers apply "the touch of tomorrow in the planes of today."

BUY U. S. WAR BONDS AND STAMPS

**Fairchild Aircraft** *Division of Fairchild Engine & Airplane Corporation, Hagerstown, Maryland....Burlington, North Carolina*


Dear Boss:
I guess I'm in a cockpit fog – and no wonder – you've really given me a workout lately! But I can take it. These W. L. Douglas people worked over me like a brother – inspected me from prop to tail 5 different times to make sure I'd give you perfect service. That's how come I've still got my looks today. But it will take a little cooperation from you to keep me that way. Just give me a rub down with polish occasionally, Boss.
Yours for good looks,
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P.S. My buddy, the Fleetwood, in rich tan leather is as rugged as a B-25. No. 4627.
$6.50 $8.50
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W. L. Douglas Shoes
Stores in Principal Cities
Good Dealers Everywhere
BUY ANOTHER WAR BOND TODAY!

(*Continued from page* 146)

The bombing of Germany's cities, industrial plants and communications in the rear undoubtedly is wearing down their strength by attrition just as the brutal attacks by the Allies on the western entrenched front from 1915 to 1918 wore down the armed strength of the Germans.

However, this attrition method did not produce victory for the Allies. On the contrary, it so wore down their own strength that by March, 1918, due to Russia's leaving the war, the Germans for the first time had greater strength on the western front than did the Allies. Only the arrival of American reinforcements at the rate of several hundred thousand a month for several months months gave the Allies supremacy once again.

The bombing of Germany has failed so far to bring any definite signs of weakening the German fighting ability on the Russian or Italian fronts. It has not stampeded the German population. It has not prevented the German submarines from going to sea and returning to their bases.

Nor are the Germans the only ones who are suffering. For us to replace the 829 American bombers lost in operations from Britain alone since January 1, 1943, requires the labor of more than 13,000 workers at 40 hours per week for one year. To launch repeated attacks by 1,000 bombers necessitates the constant presence of approximately 2,500 bombers on the airfields from which the attacks start. In order to replace the losses and planes damaged on the raids, a ratio of two and one-half to one must be maintained. The ground forces needed for the maintenance of the planes, and the personnel required for administration, supply, health, and so forth numbers approximately 125,000 for the 10,000 officers and enlisted men who man the 1,000 bombers. This is costly for us as well as for the Germans.

Napoleon said: "Fire is everything; the rest is nothing." When the invasion is made all possible fire must be concentrated in support of our landings. The decisive share of that power must come from aviation.

Dieppe proved how well-fortified is the western sea coast of Europe. Tarawa proved that, even with naval and air support much more powerful than that of Dieppe and far stronger than that possessed by the enemy, a successful attack upon land fortifications from the sea can be made only at the price of heavy casualties.

The successful invasion of the continent of Europe to set up a second front on a decisive scale must be attempted—not with a few divisions, but probably with 50 to 60.

The British Isles are close enough to allow aviation to be used to support the invasion against a large part of the German western coast defenses. Carrier-based planes, due to the ability of carriers to concentrate off any coast, can add materially to the strength of attacking aviation. If and when we have driven the Germans out of the Valley of the Po, aviation based on that valley and on Corsica will be close enough to the coast defenses of southern France to be used in the same manner.

And now the Teheran conference has decided upon establishment of a second front by the direct invasion of the continent. To be effective, the invasion must be made with sufficient troops to use up Germany's reserves. This offensive, combined with a Russian attack, should bring about Germany's decisive defeat by crushing her ground forces and thus securing her airfields and submarine bases. Such an accomplishment is necessary if unconditional surrender is to be had.

The decisions made indicate that the Teheran conference was convinced that aviation bombing alone could not bring about the unconditional surrender of Germany. In other words, victory will come not through Douhet's theory that air power can bring victory through bombing the enemy's industry and communications, but through Napoleon's which contends that it can only come through crushing the enemy's armed forces.

If the invasion is to be successful—without outrageous losses and within a minimum of time—it must be made with the strongest naval concentration, with 50 to 60 divisions, and above all with the fullest strategical and tactical powers of aviation directed wholly to the support of the armed forces, both land and sea, making that invasion. END

## Needed—a Department of War

(*Continued from page* 29)

own sphere. There has been in the past no agency to determine the relative importance of the two arms in the national defense. The army plans to save the nation by land operations. The Navy will save it by sea power. Naturally, there is overlapping, confusion and waste.

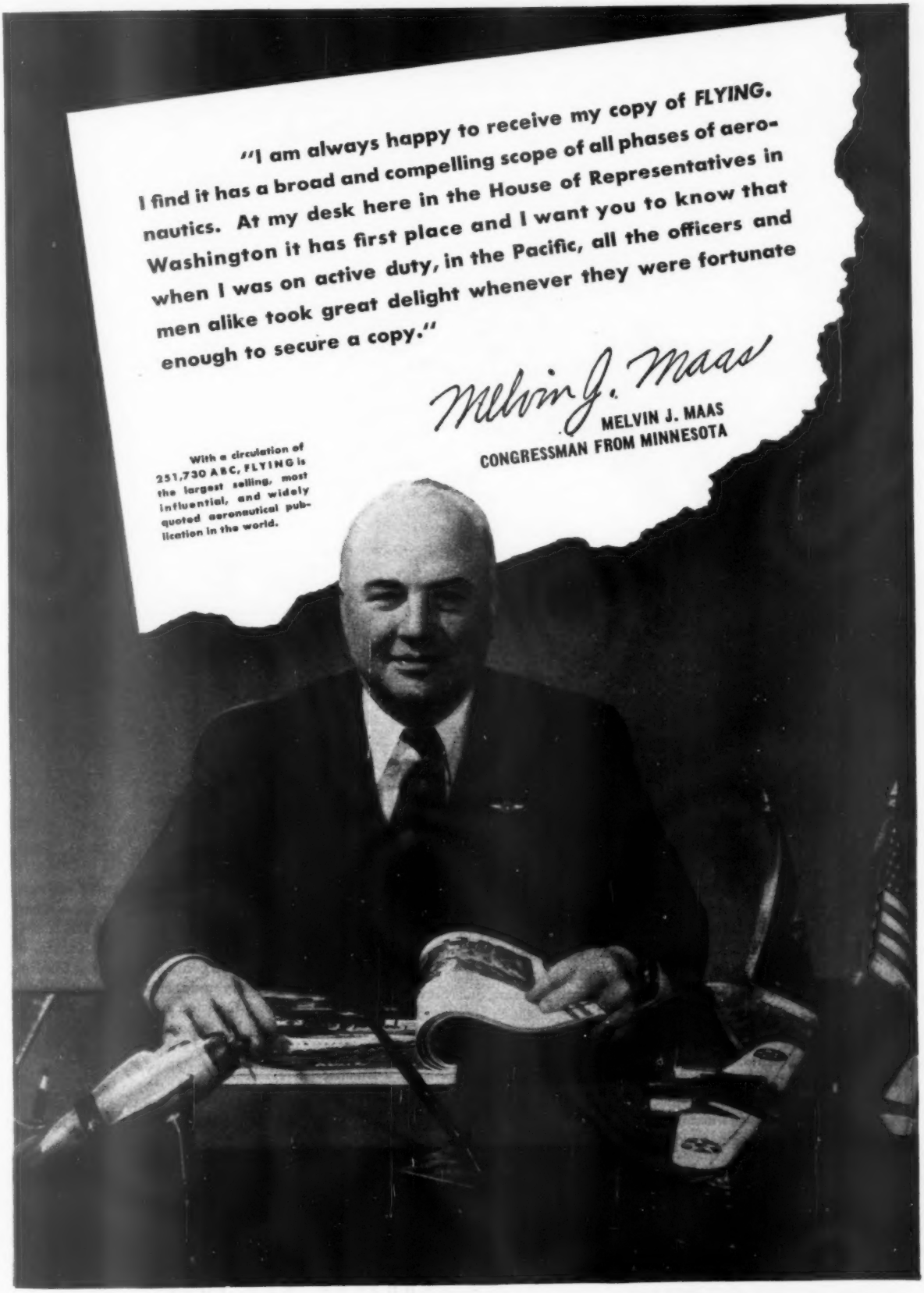
One of the most unsatisfactory features of the present organization is the position of aviation. Air power has become a determining factor in military operations. Any campaign has little chance of success unless there is preponderance of air power.

At the time of writing, a test of the theory that a nation can be defeated mainly through air attack is being carried out on Germany. It is difficult to predict what the future will bring forth, but we may be sure that the inventive genius of our aircraft designers will produce future planes that will far exceed those of the present day in speed, armament, and other combat necessities.

Aviation was hampered in its early days by conservatism and lack of vision on the part of officers in both services. There has been overlapping of functions and many jurisdictional disputes in the past between the air forces of the Army and Navy.

The Bureau of Aeronautics in the Navy Department has today little control over aviation personnel or over air operations.

(*Continued on page* 154)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# Out of the Mouths of Ugly Ducklings

FROM ATTU to Africa, from Kiska to Sicily, from Munda to New Britain, LSTs, vital units of America's great fleet of landing craft, have won laurels in a new art of warfare.

These "Ugly Ducklings," as they are known affectionately to the men who work them beachward in the face of enemy gunfire, are one of the most startling types of ship the war has produced.

Born of American ingenuity along the banks of the Mississippi, the LST (Landing Ship, Tank) was only on the drawing boards a mere two years ago. The first model was completed in October, 1942. Yet so vital are these "Ugly Ducklings" in today's amphibious warfare that production of landing craft has been given an overriding priority over all other urgency programs.

Knowing the vital importance of absolutely accurate navigation and trustworthy steering, our Navy equips every LST with the Sperry GYROTRONIC Compass, the famous Mark XIV. And as a result of experience gained in Africa and in the Pacific, the Sperry Electric Follow-Up Steering Control is specified for those currently being delivered to the Navy.

Such large numbers of these two precision devices (designed, developed, and manufactured by Sperry) are now being used that no one company can possibly produce them all. So, Multiscope, Inc., of Coffeyville, Kansas, is making the complete Steering Control for Sperry under subcontract, while the Dodge Division of Chrysler Corporation is helping to supply quantities of Sperry Gyro-Compasses, under prime contract to the Navy.

**TODAY,** this minute, these gallant LSTs are making history . . . landing tanks and men on enemy-held beaches . . . and landing them exactly where and when they are scheduled to be landed.

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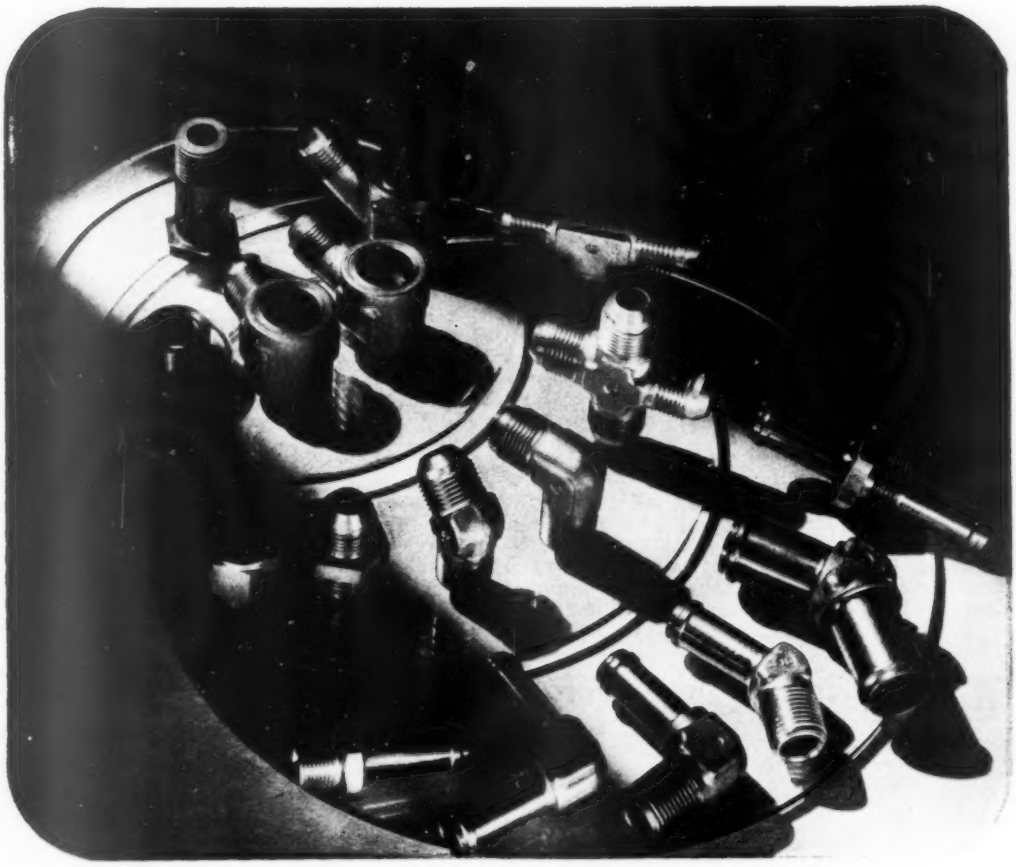

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(*Continued from page* 150)

There have been cases in the war to date where Naval air operations were directed by commanders with no aviation experience.

It has been proposed to place Naval aviation on the same basis as the Marine Corps in order to solve some of the present difficulties. While this method has some advantages, it would have the major defect of preventing aviation officers from reaching high command positions in the fleet.

Three departments—Army, Navy and Air.

Volumes of discussion and argument over this plan have been produced during the past 25 years. However, the final test of war has failed to support the proponents of an independent air force.

The Royal Air Force of Great Britain was magnificent in its defense of London, and is now doing fine work in the bombing of Germany. But in the early stages of the war, there was lamentable failure in its support of naval and military operations.

The Royal Navy was seriously handicapped on several occasions through the weakness of the Fleet Air Arm, brought about through the neglect of the RAF in previous years to develop naval aviation. Many will recall the efforts of Admiral Beatty when First Sea Lord, and of Admiral Roger Keyes to remedy this major weakness of the Royal Navy.

The British-French debacle in France in June, 1940, was due in part to the fact that there was little co-ordination between the army and the air force. From the establishment of the RAF in 1918, the army was compelled to depend on the air force for the loan of planes for carrying out the absolutely essential functions of army air. Naturally, there was lack of co-ordination and efficiency.

Just before the collapse in France, a contingent of bomber squadrons supported by fighters was sent to France as an independent command. The air component of the army was then placed under this command. So far it has never been explained whether the "Air Officer Commanding in Chief" was under the orders of Lord Gort, or even of General Gamelin, or whether he considered himself independent of both.

In the British journal *Aeronautics* of February, 1941, this affair was commented on as follows:

"The incident certainly suggests improvisation and experimental organization in the middle of a critical war and supports the view that no sufficient thought had been previously given to the proper relations between the Army and the Air Force.

"It is hard to resist the suspicion that the Air Ministry was very much concerned to assert the independence of the RAF and to resist the known desire of the Army to have its own air arm, else why the appointment of an A.O.C. in C. in France at a time when the whole idea of the campaign was unity of command."

The natural tendency of an independent force or organization is to follow its own course, and it is reluctant to work with or to share its responsibility with other organizations. This is apparent, not only in the relations between the two departments, but in their bureaus. A familiar case to Naval officers was that of the Bureaus of Construction and of Engineering, each of which guarded jealously its special sphere in the design of ships, sometimes at the cost of fighting efficiency. A long step was made in advance when these bureaus were combined in the Bureau of Ships.

Since the basic principle of success in war is unity of command under leaders trained in, and selected for, their knowledge and skill in the use of all arms, it seems logical to assume that there should be the same unity in the military departments and general staffs of the Government, and this leads to the third course: one department of war.

The outline of such an organization may be stated as follows:

The three arms will be under one department which may be called the Department of War.

The head of the department will be a civilian.

Under the civilian secretary will be a military officer who will be chief of staff.

Under the chief of staff will be two divisions: The operations division and the materiel division.

The operations division will be charged with the procurement of personnel, its training for war of all three branches, and its operation in war.

The chief of the operations division will be commander in chief of all forces in time of war.

The materiel division will be responsible for the design and procurement of all materiel for all three branches.

Under each division will be sections handling the special branches—Army, Navy and Air.

All arsenals, Navy yards, fuel plants, munition plants, and repair facilities will be under the material division.

All air stations, forts and operating bases will be under the operations division.

For the primary training of entrants into the operations division, there will be a single academy. This academy will give the basic training in mathematics, languages, engineering, military tactics, navigation and aviation. All students should be qualified for solo flying before graduation. With candidates entering between 17 and 19 years of age, it is believed that a four-year course will be adequate.

Upon graduation, the students will be commissioned in the lowest grade and assigned, preferably by their own choice, to the three branches of the operations division.

Those assigned to aviation will proceed with advanced training.

Exchange of service between the branches will be provided for.

Courses in staff schools will follow after a certain length of service in the three branches.

(*Continued on page* 156)

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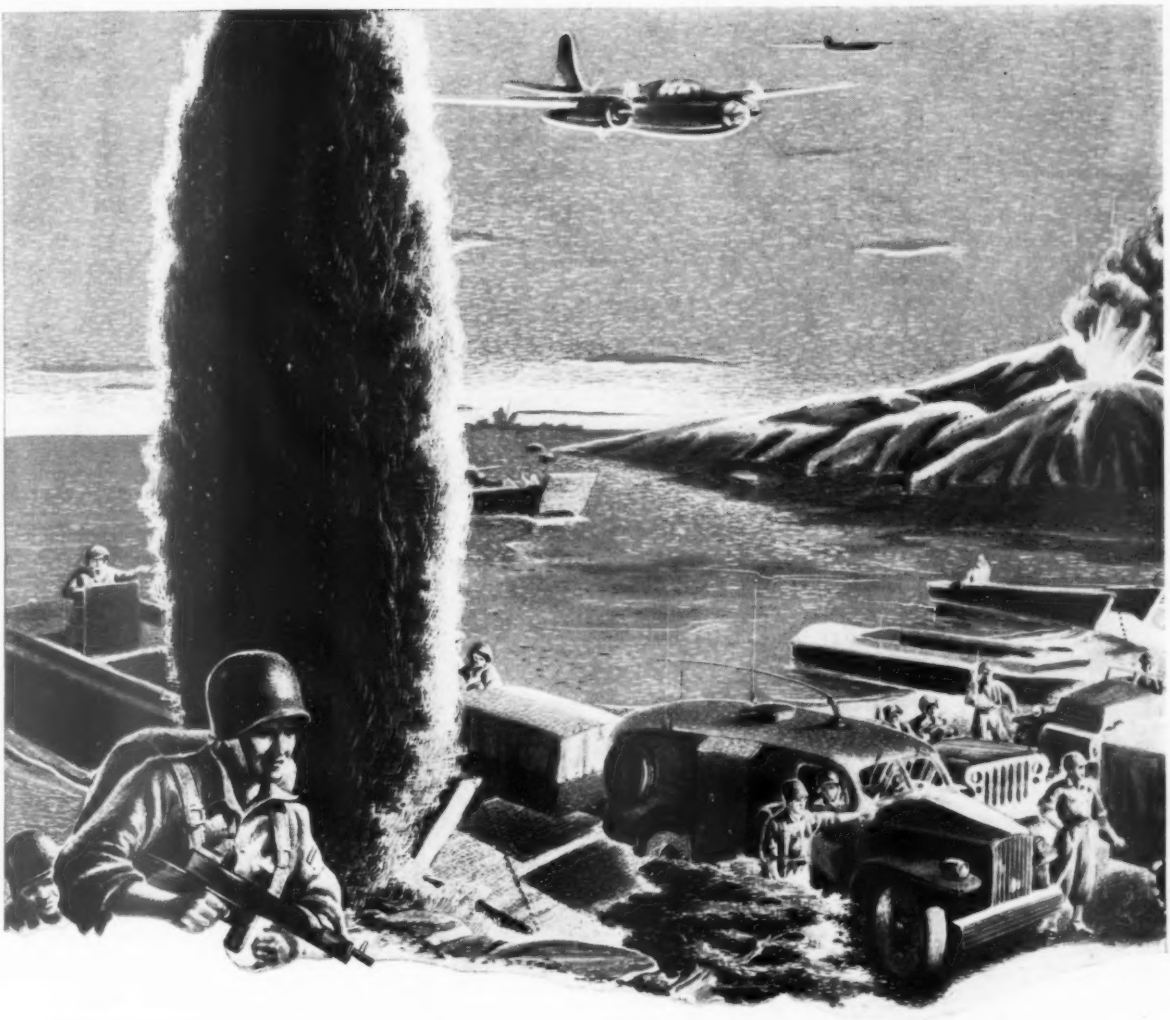

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(*Continued from page* 154)

There will be a single list of officers.

Promotion will be by selection, the criterion being:

(a) Established professional ability.
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(c) Modern conception of war.
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Officers for the materiel division will be secured from the graduating classes of the leading technical colleges, preferably by competitive examination. Upon entry, they will be given a post-graduate course to familiarize them with the customs of the service.

There will be a single list of materiel officers.

The promotion of materiel officers will be by selection, this to be based in general on the ability of the officer to improve existing material, or to design more efficient types.

One of the important factors for success in war is to have officers in high command who have been carefully trained in all three branches, and who have been selected for this duty on account of outstanding ability.

The selection should begin in the lower grades. War College courses should be provided for officers of the operations division who have been earmarked for high command.

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Materiel officers are assigned permanently to the duty of the design and construction of materiel. That is their life work.

Operation officers devote their entire career in training for the most efficient use of this materiel in time of war.

The proposed plan is obviously a radical change in the existing organization. However, it is believed to be far preferable to one of three separate departments which looms in the offing at present.

Furthermore, it would meet the requirements of modern war, provide for a logical and co-ordinated determination of the size of each arm and, last but not least, would assure the most efficient use of the sums appropriated by the Congress for our national security. END


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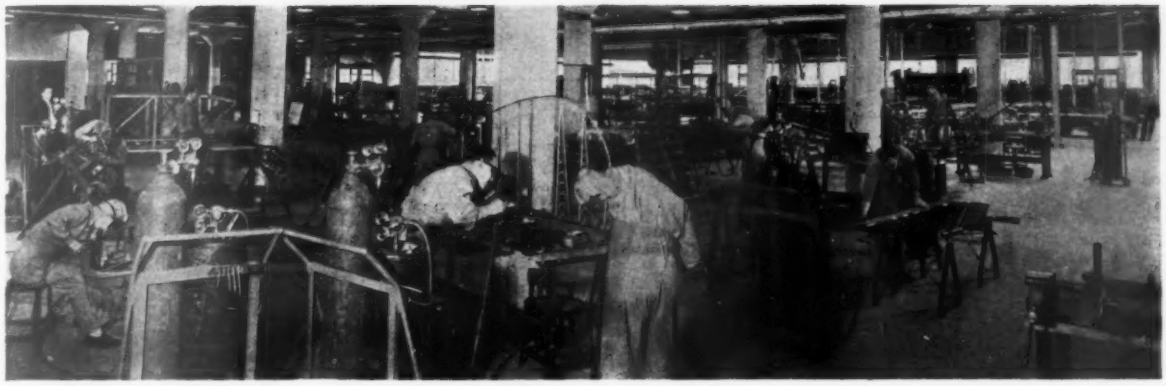
## 15 YEARS AGO

FROM the March, 1929, issue of this magazine:

The separate squadron for training Naval reserve flying cadets at Pensacola, which had been transferred from San Diego and Hampton Roads, was incorporated with the squadrons of regular Navy personnel receiving aviation training . . . Willis Ray Gregg of the United States Weather Bureau said: "Weather service for aeronautics is in the pioneer stage. We are trying out different schemes. We hope and believe some of them are along the right lines" . . .

Capt. Ira C. Eaker (now a lieutenant general) reported that worn rocker arms were responsible for the forced landing of the Army's tri-motored Fokker plane, *Question Mark*, on an endurance flight after 150 hrs., 40 min., 15 sec. . . . Another Army officer, Maj. Carl Spaatz (now also a lieutenant general), handled refueling operations aboard the *Question Mark* . . . One of the biggest factors in the development of safety in aviation was the "comparatively new" duralumin propeller . . . An anti-spin safety device had just been patented which consisted of applying a sheet of material folded down flat against the wing surface, to be lifted to form a pocket through which the air rushed in a spin . . .

The United Aircraft and Transportation Corporation had just been formed by the merger of the Boeing Airplane & Transportation Corp., Pratt & Whitney Aircraft Corporation, and Chance Vought Corporation . . . The use of aerial photographs for assessing realty was advocated by Fairchild Aerial Surveys, Inc. . . .



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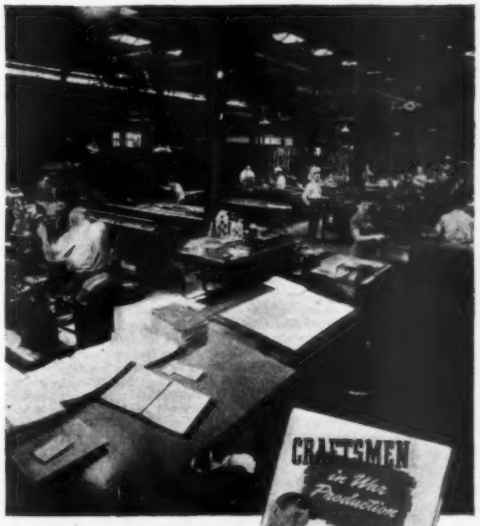


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## The Luftwaffe

(*Continued from page 53*)

Exceptions and additional pay ratings for officers beyond the rank of depending on their abilities, their length of service, and their pull with high-ranking Nazi politicians, are so numerous that no accurate figures have been compiled. Generally speaking, pay goes up proportionally to USAAF stipends for higher ranks.

Trained and commissioned, the officer-pilot steps into a streamlined fighting organization. It gets its grand strategy from the Obercommando der Wehrmacht —Hitler to you—or one of his immediate coterie of aides commissioned to speak for him. Usually it's Goering. Goering then passes the bad news along to the general in charge of a luftflotte, or operational command.

Operations is divided into two groups. The flying half of the combination is called the fliegerkorps, consisting of 81 aircraft, divided into units of 27 each, each unit consisting usually of aircraft of the same type. For example, one fliegerkorps might be made up of 27 pursuits, 27 transports, 27 bombers, another of 54 pursuits, 27 bombers; a third, all pursuits; a fourth, all bombers.

To keep a fliegerkorps flying they have the other half of operations, the luftgau, or administrative and supply command, composed of three airfield regional commands, with each command composed of three airfields each. Thus—on the Luftwaffe organization chart—you have a basic unit of 81 planes fighting from nine airfields.

Organization charts actually are shot full of alterations when it comes to actual combat. Generally, the basic pawn in the game is the staffel, the smallest unit in a fliegerkorps, consisting of nine aircraft. These staffels form the units scattered over the fronts defending the German war machine and are the common denominator from which defense commands try to figure out the problem of fending off bomber attacks on the Reich. Sometimes they are reduced to units of five and take off from small fields near the fronts or hidden in the Reich. Again, an extra plane is added for replacements and the unit is 10. Units of 15 and 20 have been observed recently coming up to meet the bombers from England now in the midst of the colossal task of breaking the back of the Reich. Since that offensive began, Nazi emphasis has been placed more and more on fighter and pursuits units, with bomber work relegated to nuisance raids on England and to special assignments on the fighting fronts. Whether the divisor for such units has been changed from nine to five is immaterial—the fact remains that the staffel is the smallest link in the iron chain that, put together, makes the Luftwaffe. It is a highly versatile and resourceful link and is being employed, today, to the limits of its capacity by those who forget it.

One of the greatest illusions that seems to be held by everyone—except those who know the Luftwaffe pilot from personal experience—is that he is an automaton, that he takes orders, asks no questions, cannot improvise and is generally the typical Bavarian waiter when it comes to performance in combat. Nothing can be farther from the truth. He is not only tough, he is dangerously resourceful.

This is partly due to the way he was selected. Goering, as has been indicated, refused all but the cream of Nazi youth. It is partly due to the way he was trained, a training which included a clear understanding that, while under the iron thumb of the Luftwaffe command, the pilot was nevertheless a priviledged character in the German war hierarchy, received special leave and rations privileges, and —most important—was master of his own cockpit when emergencies arose. A third factor was that pre-war top personnel, typified by the late Ernst Udet, were men many of whom had lived through the free-and-easy air fighter atmosphere of the last war and kept it alive as best they could when the Nazis started organizing for this one. They were given practically *carte blanche* and were encouraged to improvise. This spirit permeated throughout the organization and, though considerably subdued by the RAF and the AAF, still prevails today.

It followed that bomber, transport and glider pilots, as well as the combat boys, become the envy of others in Nazi uniform and set up laws unto themselves. Quick changes were made and are made to meet emergency conditions. The Battle of Britain failed; therefore, emphasis throughout the training and fighting system shifted gradually to combat. Crete could best be taken by gliders; glider battalions were trained and put into action. Pursuit pilots were dying like flies under the withering fire from *Fortress* gun turrets; a "blind-spot" was discovered and a maneuver devised to get to it in the quickest and safest way possible.

Daily, new indications of Nazi resourcefulness under battle conditions come in. Early in the war German squadron leaders took active part in the combat, coming in for the kill after their fellows had softened up and confused our pilots. More recently, notably during the Regensburg raid, a Nazi leader in a Messerschmitt Me-110 sat out of range during the entire run to the target without once coming in for combat. It was discovered later that he had directed the entire battle, calling up fresh planes in advance of the attack and instructing those in contact with our planes, without once firing a shot.

Similarly, the Luftwaffe developed aerial bombing in another futile attempt to stop the flood of *Fortresses* from England and was also instrumental in the development of the rocket gun, equally

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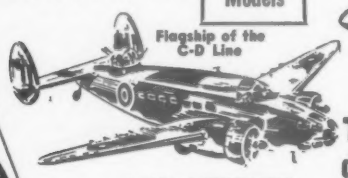

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ineffectual, but nevertheless damaging and an indication of the initiative of the enemy.

Equal initiative is indicated among ground crews and those directing the combat from the ground. Nazi fighter controllers have been spotted in every battle area to detect, report and oppose enemy attackers and set up defenses on their own. This system was refined and perfected in the African campaign, as was the system of carrying—and evacuating—troops and supplies by plane. Fighter controllers have seldom been caught napping and only once got their pursuits off the ground at the wrong place at the wrong time. This was the recent raid on Leipzig, which began with our bombers feinting toward Berlin. German pursuits came up to meet an empty sky and could not get down and gas up again in time to do an effective job on our planes where the real show was going on, over one of Germany's most important rail and manufacturing centers.

The automaton illusion (which it is fair to assume the Nazis have promoted among unsuspecting enemy laymen) is almost matched by the illusion that German fighters are cracking and ready to fold. Again, such talk gives the enemy the advantage because, if we believe it, we are left off guard. It is—bluntly—not true. Just as the German is the most resourceful of the enemy pilots, so he is the most cocksure. Prisoners captured in the African campaign were so certain of ultimate victory that they considered the stories told them of bombings in Germany as propaganda. Superman confidence typifies the Germans brought down over England. Sure, things are tough. Sure, the current bombing records are going the other way. But Hitler's chosen instruments will win out in the end, and the greatest of these are his pilots. Only a few recently have shown signs of doubting the Nazi fairy tale and their ultimate role of hero in it.

The morale of the German aviator has been badly shaken by the constant pounding and reverses he has taken since the Battle of Britain. But, shaken though he is, his will and determination have not been broken—yet.

Ask any Yank pilot who's fought his way out of a cloud of Me-109's or Focke-Wulfs. He'll tell you that his enemy is well trained, well disciplined and a top-notch fighter. Your Yank pilot won't say this to give the enemy a puff. He'll say it to give you an idea of just how tough these Nazi airmen are. END

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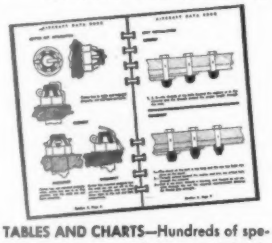

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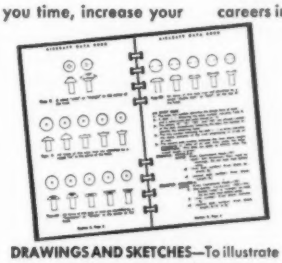

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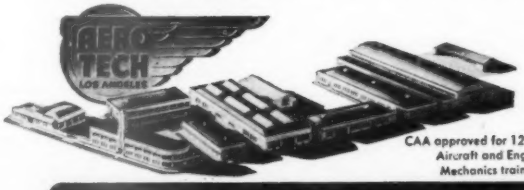


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## Saturation by Fire

(*Continued from page 75*)

bombs that rocked the capital to its foundations.

The other favorable factor in the winter air war is equally real but more difficult to document. The bulk of the evidence to date consists of film brought back by reconnaissance pilots, flying *Spitfires, Mustangs, Mosquitoes,* and *Lightnings* at 30,000 feet. Pictures are taken of all major targets before and after raids, and the post-mortem photos reveal devastating damage, especially in the Ruhr, Hamburg, Berlin, and Hanover. British Bomber Command reported at year-end that 24 German towns and cities had been knocked out, and 20 more severely damaged. But Bomber Command is far more interested in "invisible dividends," and their experts estimate that these dividends, on previous aerial offensives are being paid now by the Nazis.

"Tanks and U-boats," says an RAF spokesman, "as well as guns and equipment, are not available for operational use because the factories which might have made them have ceased to exist."

The destruction of the Mohne and Eder dams [also see FLYING, February, 1944] last May is a case in point. Reconnaissance pictures indicate that more than one Hun got his feet wet—if not his house and his factory—the day the dams went out. But the experts estimate that the worst military effects of these spectacular raids came late in the fall and early in the winter. A few factory wheels clogged with mud and water or stilled for lack of power in May have produced "too little and too late" to meet the excessive demands on Germany's many fronts as the United Nations mount their victory offensives.

Supplies have thinned or stopped from Germany's industrial big seven—Hamburg, Essen, Cologne, Duisberg, Duesseldorf, Berlin and Nurmberg. The reasons are not far to seek. In 1943 it is estimated that Berlin rocked under 25,000 tons of bombs and incendiaries, Hamburg 11,000, Essen 9,000, Cologne 8,000, Mannheim 7,000, Ludwigshafen 7,000, Duisberg 6,000, Duesseldorf 5,000, and Nurnberg 5,000. The Ruhr got a 50,000-ton over-all quota. Total tonnage dropped by RAF Bomber Command on Axis territory during the year was 155,000 tons, of which Germany received 135,000. The Luftwaffe by contrast has dropped only 75,000 tons on Britain throughout the war. The RAF, on the other hand, after dropping only 5,250 tons in the last half of 1940, steadily increased its concentration from 23,000 tons in 1941 and 37,000 tons in 1942 to 1943's 135,000 tons.

Payments are also due elsewhere. Wilhelmshaven, Keil and other shipping and U-boat bases received shattering blows during the summer and fall. Down-payments were collected as early as August.

"In spite of the increased U-boat activity at the end of the month," said an October 9 statement issued under the authority of President Roosevelt and Prime Minister Churchill, "the average merchant ship losses from all causes in August and September together are the best record of the war."

RAF spokesmen pointed out that time lags vary considerably between the destruction of an industry or a factory and an operational scarcity of what they make. All reserves, in storage or in transit, must be used up. It is known that destruction of basic industries, such as existed in the Ruhr, or of a great shipping center like Hamburg, takes much longer to show tangible results than, say, the destruction of an ammunition dump. But, generally speaking, the longer the wait, the more vital the shortage when it comes, and the more widespread the demands for the products.

The gasoline shortage in the Reich is having paralleled delayed and damaging effects on the German war effort. Most dramatic example is the backfire it has built up for Mr. Goering's Luftwaffe. Lack of gas and oil is now cutting heavily into the enemy training program. Potential pilots are waiting and have been waiting for weeks to begin training. Desperate for replacements, training centers use up their gasoline allotment for a month in a few days. When the boys dc get to their flight training, it is inadequate because the shortages have made it necessary to cut the number of training hours almost by half. A recent British statement, however, indicated that the German war machine may be getting sufficient fuel, now that Italian allotments have been transferred to the Reich.

No detail has been overlooked to assure that the Germans pay off their "invisibles" during the winter. A carefully-planned offensive was launched early in the year against locomotives, and today it is conservatively estimated that 1,000 have been put permanently out of action. Another 500 can be written off as the result of the destruction of locomotive plants. Consider this in terms of the U.S. rail system which, though fully equipped and up-to-date, is taxed to capacity, and you see the reason why evacuees from the Ruhr were forced to move by river craft and movement of troops and supplies has become increasingly difficult.

On the home front, the Germans are running out of necessities as well as morale. Need of the people to evacuate bombed areas has resulted in what the Germans themselves describe as a "traveling season of gigantic extent," overtaxing railroads, housing facilities and food supplies. Bombings have, according to reports from within the Reich, threatened the nation's flimsy financial structure. Insurance companies have been especially hard hit. Household necessities—pots, pans, and condiments—are bringing runaway prices. So hard hit is the clothing industry that it has been prohibited from making anything but mourning clothes and uniforms—ironic necessities among a people who set out to conquer the world.

"More than a quarter of a million persons were rendered homeless in Hanover," reported Air Marshal Sir William Welch, head of the RAF delegation in Washington, recently. "This represents

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half of the population. Americans can imagine what that would mean if, by the end of any given week, half of the population of say, Detroit found their homes smashed, the public utilities gone —no water, no medical attention, no fire department, no sanitation, no other facilities which are so easily accepted because we have come to know them always to be there."

All of this is not to say, of course, that the German has ceased to give the utmost opposition as the United Nations close in. But it is significant that the percentage of RAF casualties is not rising, while the tempo of the attacks daily heightens.

At least one German "secret weapon" has gone up in the smoke of their airplane rocket gun, first encountered by AAF flyers over Regensburg and then over Schweinfurt and elsewhere. Though a weapon not to be ignored, it has proven faulty in that it takes a matter of seconds to build up its velocity—a vital handicap when aimed at a speeding airplane. U.S. bomber and fighter pilots are reported taking it in their stride, less bothered by it than by flak. A RAF pilot recently described it as "inconvenient."

"Barring the unforseen," another RAF spokesman said recently, "we will continue to drop more tons of bombs in more places for the duration."

Prospects for the Luftwaffe are summed up as "grim." U.S. daylight bombing is daily proving itself more effective. The RAF alone has in action 50 per cent more frontline aircraft in all theaters than Germany. Russia has won air superiority on the eastern front. British and American production leads that in Germany by more than four to one.

Any way you figure it, it looks like a long, hard 1944 for the Hun. END

## Reclaiming Enemy Airdromes

(*Continued from page 47*)

made enough of a runway for the *Skytrain* to get out again and return for many trips.

"Then, one Sunday morning, the Japs decided to stop us. They sent in 12 medium bombers escorted by from 20 to 25 fighters. But we got up a flight of *Airacobras* and every one of the bombers was shot down plus three of the fighters, while we lost but four fighter planes. Unhappily, however, the raid came just after Chaplain Keith B. Monroe of Oakland, Calif., had finished morning services, and while he was helping men into foxholes and shelters one of the Jap bombers crashed and exploded on our runway, killing the chaplain and wounding several of the men.

"But that field, within a few days, played an important part in the attack on Lae and Wewak."

In Tunisia, General Godfrey says, the mine-clearing detachments proved most important. Their evacuation had been so swift that the Germans did not have time to mine many of the airfields. But it was necessary for the air engineers to lay out several landing strips in mine fields laid against tank and infantry attack. In these cases the lessons of the special anti-mine school set up in Africa proved invaluable. In one instance air engineers trained in that school removed without a single accident 1,788 tank mines from a future flying strip.

General Godfrey explains that when the air engineers land, their job is to make new runways or to repair old ones. In many instances one of the most important jobs has been to clear the runways of wreckage of enemy planes, for strafing by our .50-caliber machine-gunned planes is as destructive of equipment on the ground as it is of planes in the air. In many instances a hit in a gas tank by a tracer bullet has produced explosions and fires that destroyed whole ranks of Japanese planes.

The second task of the airborne engineers is to provide taxiways, dispersal areas and "hard standings" for our own planes where they may be stored and serviced. Servicing facilities, at first, are of the most primitive kind. Gasoline and oil is flown in in drums and disposed of in camouflaged dumps. Later, underground storage may be provided.

In some areas, of course, it is necessary to provide shelter for both airplanes and personnel. For airplanes the air engineers have devised a hangar of light steel framework and canvas that can be flown in. Working with earth on the runways and revetments, the air engineers have developed great skill in constructing barracks and other buildings out of rammed earth, requiring a minimum of outside supply.

The steel mat has proven a life-saver in many areas. It enables planes to operate from apparently hopeless surfaces, varying in character from the oozy mud of the jungle to the equally unstable tundra of the Arctic. But the steel mat is a heavy item of equipment, particularly when it has to be flown in. So, wherever possible, its use is limited. The engineers of the Air Force have already developed compounds of local soils, from the sands of Africa to the mangrove swamp muck of the South Pacific, with which, given a little time, they are able to work up runways of remarkable weight-bearing quality and stability even in wet weather.

Wherever possible, as soon as a field has been established and seems to have some permanent value, the air engineers get busy building roads over which more and better equipment can be hauled in while the air transports can be used for flying in the men and material to make and defend the next fields in advance. In some instances, of course, fields that have been captured and repaired or constructed from scratch, have been abandoned completely in favor of newer fields closer to the advance.

The cost of this is admittedly high—just as is the cost of the more elaborate fields which have been laid out, paved, and equipped with buildings and shops in the rear areas. Air engineers see little post-war salvage value in many of these large rear-area fields. They have been built as a military necessity. In many instances their location gives them little or no relationship to civil and commercial flying.

"It's all part of the cost of the war," says General Godfrey. "It is, by peacetime standards, a high cost in money. But money is of small consideration when it is a question of giving adequate air cover, life-saving air cover, to our advancing troops."

General Godfrey made these observa-

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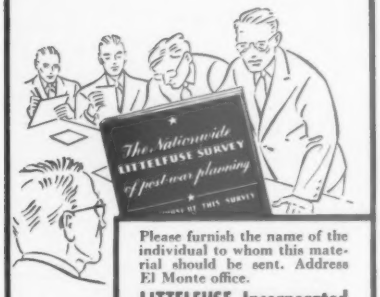


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"The bombers and the fighters are handing it to the enemy round the clock from the sky. The engineers are enabling the bombers and the fighters to get into the sky round the clock to do it, whether it's right up under the enemy's guns, or back in our own areas." END

## Report from Washington

(*Continued from page* 65)

ting a word about it leak. The secret had been kept so well, indeed, that many who had worked on certain aspects of the development refused to believe that the plane existed when the story first appeared.

At this writing, certain facts can be revealed about the revolutionary aeronautical device.

It could be mistaken in flight for a fighter—perhaps a *Thunderbolt*—but it is much lighter than a *Thunderbolt*.

The plane went into mass production by Gloster in England and Bell over here some time ago.

Its take-off and landings are swifter and it climbs faster than conventional types, but it is just as safe if not safer, a factor credited largely with the fact that the entire development was completed without accident.

It follows that it is *not* a rocket plane. A rocket plane may be announced in our next installment of fantasia, but a rocket plane is something else again entirely—in case you don't already know. Rocket designs are to assist in fast take-offs and help out a conventonal power unit in an emergency. You have no control over the rocket device once you set it off. Jet propulsion planes, typified by the Bell model, are highly controllable and maneuverable.

In England, natives who have heard the plane overhead have named it "Squirt." It announces itself on the horizon with a high scream; closer, it sounds like a huge teakettle at full boil. Now you see it and now you don't—its top speed has been estimated by ground observers to exceed 500 m.p.h.

It flies easy. The power unit shows signs of being as reliable, if not more reliable, than conventional power units. It will be far more difficult to knock out of combat.

As contrasted with conventional models, the plane is much more efficient (and uses less fuel) at ceiling altitudes. Its ceiling is higher than anything now in combat.

It is adaptable to bomber uses and as soon as the fighter model is perfected, will be used in a radically new bomber design now on the drafting boards.

Pilots have already been trained to fight and fly it both here and in England, and an expanded pilot training program is under way. Students will train on conventional ships just as they now do up to the point where they are ready for multi-engines; then they are ready for the jet job.

### Briefings

If there is any further doubt concerning the volume of aviation business these days, consider the case of Herman "Pop" Grube, treasurer of Douglas. Pop's signature on checks last month laid end to end would have reached twice around the world. . . . CAA is making a survey of airport management. Good management ideas will be assembled by the Airport Division in Washington from the field. Digested, they will then be distributed to interested airport managers all over the country. J. Kirk Baldwin, once a fixed base operator and formerly state treasurer of Wyoming, more recently with the War Training Service, is in charge of the work. A sermon against absenteeism comes to us through Roy Noble of Beechcraft. He cites the record of Leonard Harmon, Sr., a Beach Aircraft Corp. trucker in Wichita. For fifteen months, Harmon was never late nor absent for any reason. One day a few weeks ago his son, Leonard, Jr., hit

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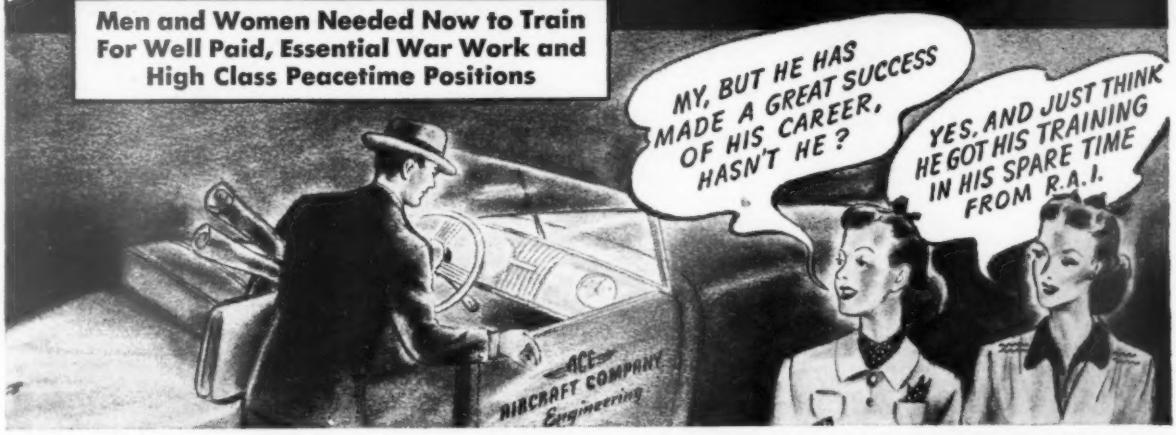
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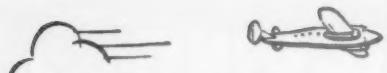

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the headlines as hero of hill 1017 in Italy. Young Harmon, a paratrooper, knocked out a German machine gun nest to speed the Yankee advance. Another Harmon boy is in the Navy, overseas, and the father is a veteran of the last war, when he saw action in three major engagements in France. His son's heroism seemed to call for a celebration, and celebrate the old man did—by showing up for work and keeping his attendance record perfect. . . . Another home-front record is that an average of 60 employees of Pennsylvania - Central Airlines report each month to the Mobile Blood Donor Service when it visits Washington National Airport. Leading them is Sgt. Carl Neuman of the Auxiliary Military Police Force of PCA, who has given 78 donations over a period dating from the First World War. . . . Anesia Pinhiero Machado, Brazil's first woman pilot, who was recently signed by Pan American do Brasil after completing CAA courses sponsored for her by the Rockefeller Committee, went home the other day bubbling with inter-American good-will. But she carries with her two secret disappointments. After winning her CAA instructor and instrument ratings, she wanted to give Mrs. Roosevelt a flying lesson and campaigned so persistently to do it that only the combined opposition of all U. S. bureaus concerned succeeded in stopping her. She finally settled for a White House luncheon invitation, but got her second disappointment when she had to leave before the appointed day. She is already planning to come back and pick up a rain check—flying her own plane. . . . CAA's annual report for 1943, due out soon, will show that the miles flown by U. S. air transport per fatal accident estimated a few weeks ago are substantially correct—46,561,000 in 1943, as compared with the 1941 (stet) figures of 35,255,670. . . . Aircraft operations in the U. S. handled by airway traffic control also jumped from 9,208,776 in 1942 to 16,227,027 in 1943. Total operations in the last half of '43 were more than for all of 1942. . . . A drawing of a *Flying Fortress* in a recent Bendix advertisement indicated the installation of three 20-mm. automatic aircraft cannon in the starboard wing. . . . END

## Co-Pilots for Bombers?

(*Continued from page 45*)

amount of work he does is about the same as when he had another pilot at his side.

Opponents of the one-pilot system objected most strongly on the ground that if anything happened to the command pilot, there was no one to bring the plane home. Facts showed that, except in rare instances, when anything happened to the pilot, either the plane was too badly shot up to get back or there were men in the crew with enough flying experience to return the ship to England. It was further pointed out that the return trip is the least difficult of a raid. In an emergency, the navigator may steer a westward course, pick up the islands, and if necessary the crew can parachute.

The British officer largely responsible for establishing the one-pilot system was emphatic in stating that the system was


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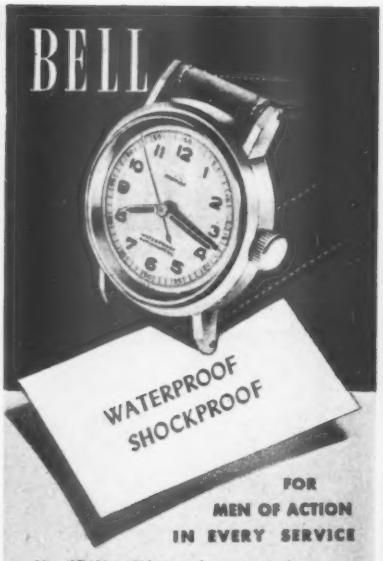


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in no way a reflection on the AAF's two-pilot system.

"The one-pilot system is history, and, like every other development, is of interest to our Allies in this country," he said. "It is definitely not in any sense the basis for a controversy. Our only conflict, as is equally the case of the U. S. Army Air Forces, is with an organization known as the Luftwaffe. I believe it is a conflict that we are winning, first because we have worked together so admirably, and second because, even in time of war, there is every opportunity in the democracies for each nation to do its job of work toward victory according to its resources, its needs and its fighting techniques." END

## Chile's Air Transport

(*Continued from page* 68)

land almost at will. But *because* of its topographical difficulties, which impose obstacles in the path of ground transportation as well as airport construction, aviation will play an increasingly important role in the life of the nation. Once aloft, the skies are an open highway.

Recognizing this, the Chilean government is placing great emphasis on aviation promotion. In 1941, the president of Chile launched a campaign to raise funds with which to buy aircraft to be allocated to aero clubs in all the important cities, including Chilan, Curico, Copiapo, Concepcion, Cauquenes, Osorno, Puerto Montt, Los Andes, San Felipe, Santiago, Temuco, Valparaiso and other cities. Many civilian pilots receive their training through clubs affiliated with the Club Aero de Chile, which in turn is linked with the Federation Aeronautique International.

A new civilian field was dedicated in San Felipe on August 29, 1943. The government turned over an airplane purchased with funds which were collected during a "Wings for Chile" campaign and an additional plane purchased with privately collected funds was added to those owned by the San Felipe Aviation Club. Other training and instructional planes have been distributed to civilian aviation clubs by order of President Juan Antonio Rios.

Chile recognizes that her present air services are but a beginning and anticipates enormous expansion in the future. To assure her present plans being soundly based, however, numerous missions have been sent to other countries, principally the United States.

Chilean Air Force officers, headed by Lieut. Gen. Manuel Tovarias Arroyo, chief of the Chilean Air Force, recently toured United States aviation bases and factories. Group Comm. Raul Gonzales Nolle, chief of the Chilean Air Commission, inspected numerous factories in the late summer of 1943, with Capt. Pedro Loyer of the Chilean Navy. Shortly after, Commander Nolle took up duties as air aide in the Chilean embassy in Washington. END

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## Those Cockpits

THE cockpits shown on pages 48 and 49 are as follows:

1. Consolidated *Catalina.*
2. DeHavilland *Mosquito.*
3. Douglas *Skytrain* (DC-3).
4. Lockheed *Lightning.*
5. Bell *Airacobra.*
6. Boeing *Flying Fortress.*

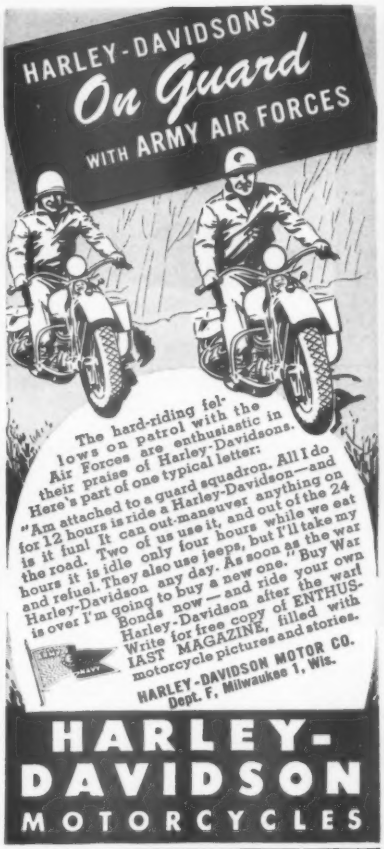
## B-29 Details

CONSIDERABLE data on the AAF's hitherto highly secret Boeing *Superfortress* (B-29) are published for the first time in the December 30, 1943, issue of Flight, the British aviation magazine.

The article describes the new giant bomber as having tricycle landing gear (all wheels having double tires) and retaining the general features of the present *Flying Fortress* (B-17G). According to the Flight article, the bomb load of the B-29 is 16,500 to 17,500 lbs. for a 1,000-mile range, or 6,000 lbs. for a 3,000-mile range. Armament is described as ". . . comprising a chin turret, as on the B-17G, dorsal, ball and tail turrets, and barbettes on each side of the fuselage operated by remote control."

Other details in the Flight article:

Wing span: 141 ft.
Wing area: 1,739 sq. ft.
Length: 99 ft.
Cruising speed: 250 m.p.h. @ 25,000 ft.
Gross weight: 100,000-120,000 lbs.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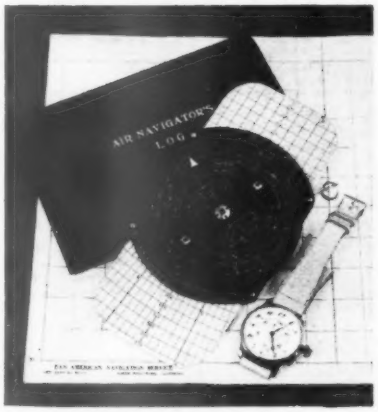


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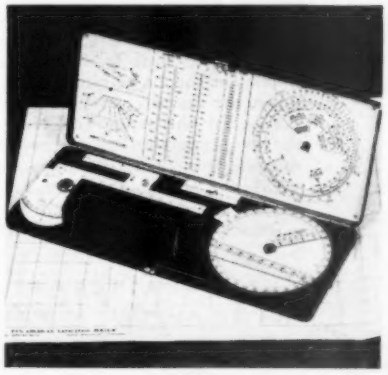

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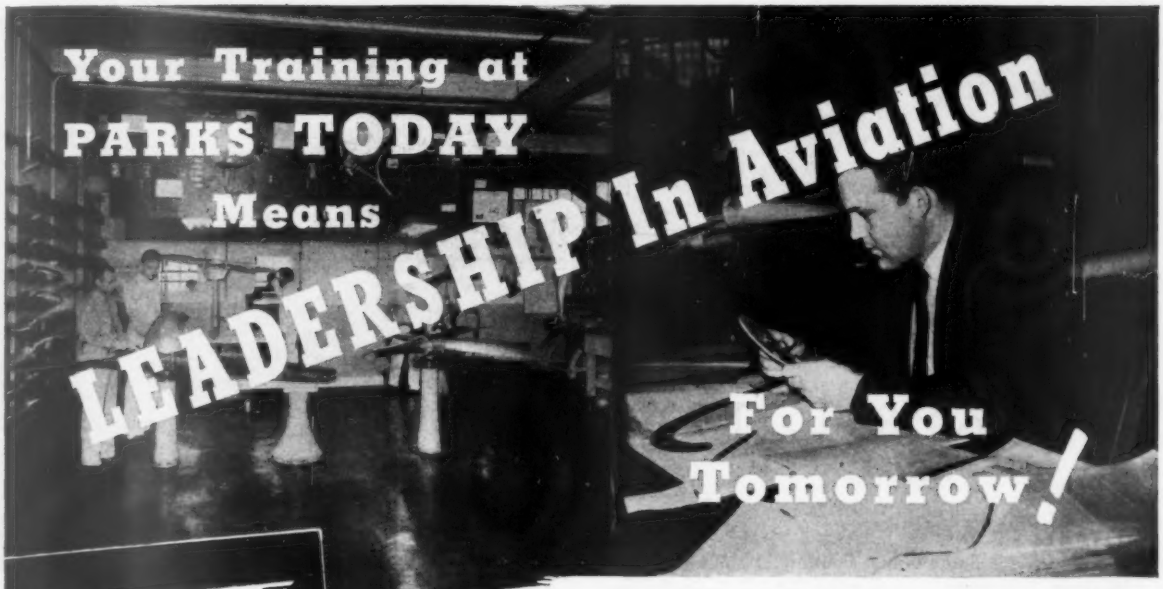


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